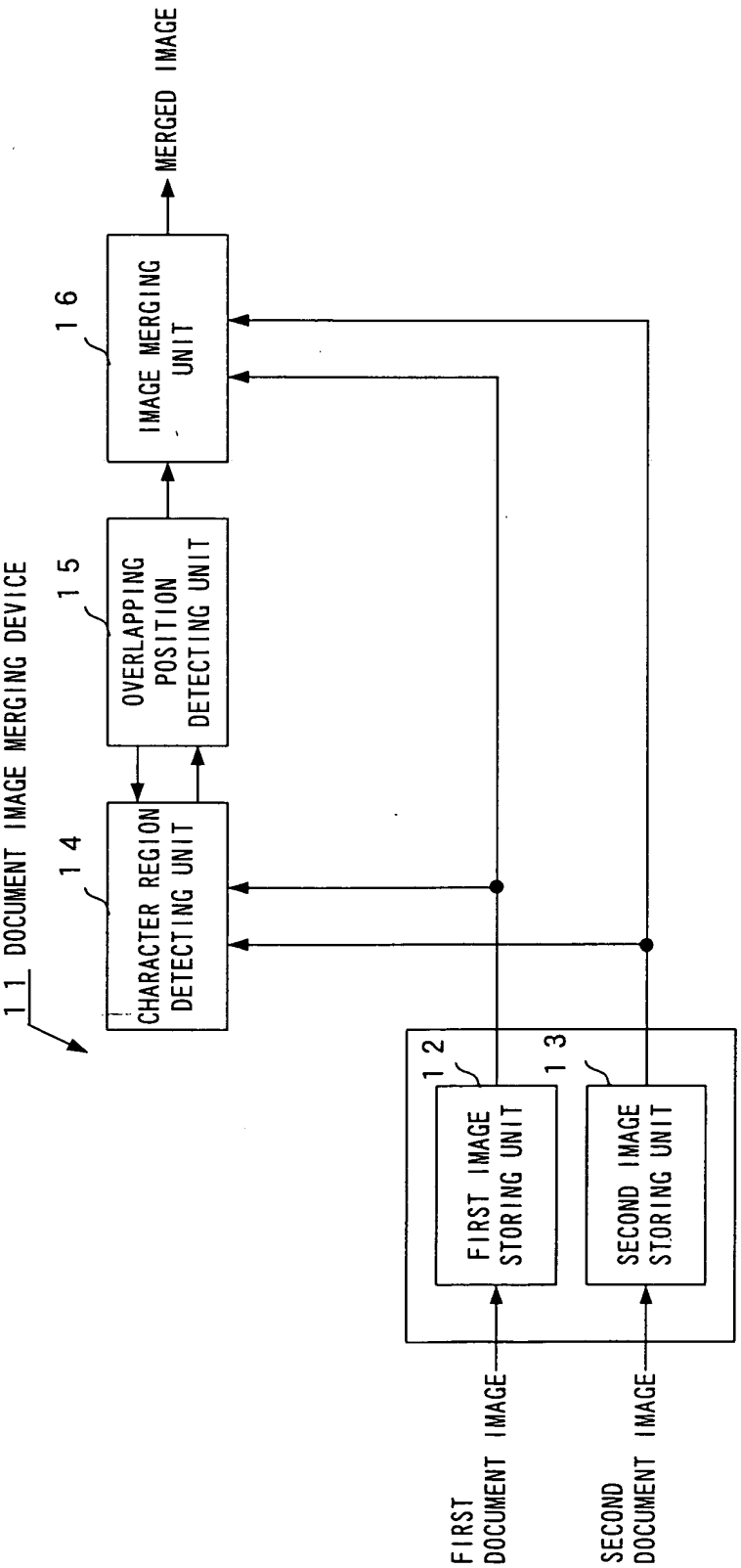

11 DOCUMENT IMAGE MERGING DEVICE
14 CHARACTER REGION DETECTING UNIT
15 OVERLAPPING POSITION DETECTING UNIT
16 IMAGE MERGING UNIT
MERGED IMAGE
12 FIRST IMAGE STORING UNIT
13 SECOND IMAGE STORING UNIT
FIRST DOCUMENT IMAGE
SECOND DOCUMENT IMAGE

FIG. 1

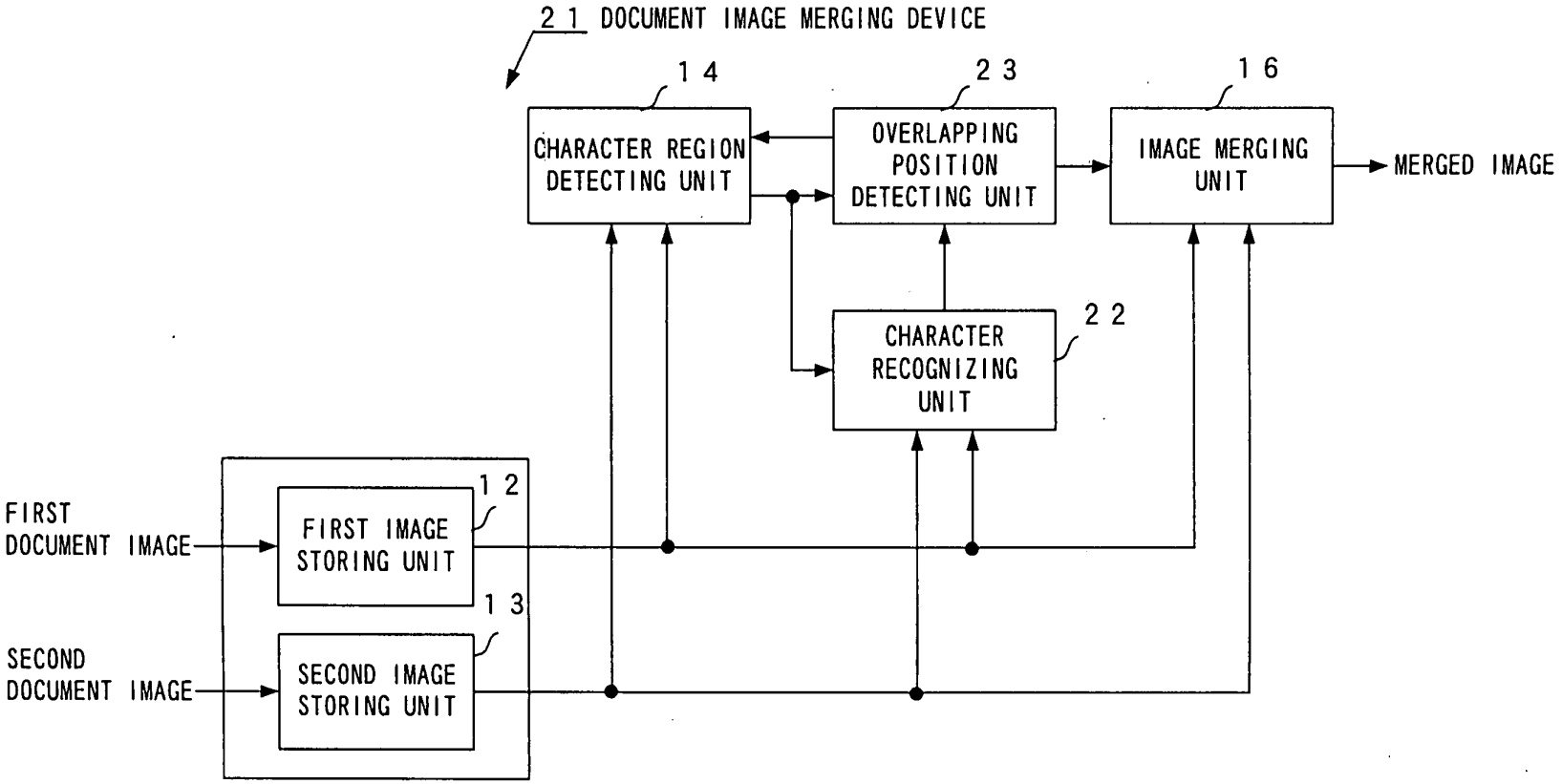

21 DOCUMENT IMAGE MERGING DEVICE
14
23
16
CHARACTER REGION DETECTING UNIT
OVERLAPPING POSITION DETECTING UNIT
IMAGE MERGING UNIT
MERGED IMAGE
22
CHARACTER RECOGNIZING UNIT
12
FIRST DOCUMENT IMAGE
FIRST IMAGE STORING UNIT
13
SECOND DOCUMENT IMAGE
SECOND IMAGE STORING UNIT

FIG. 2

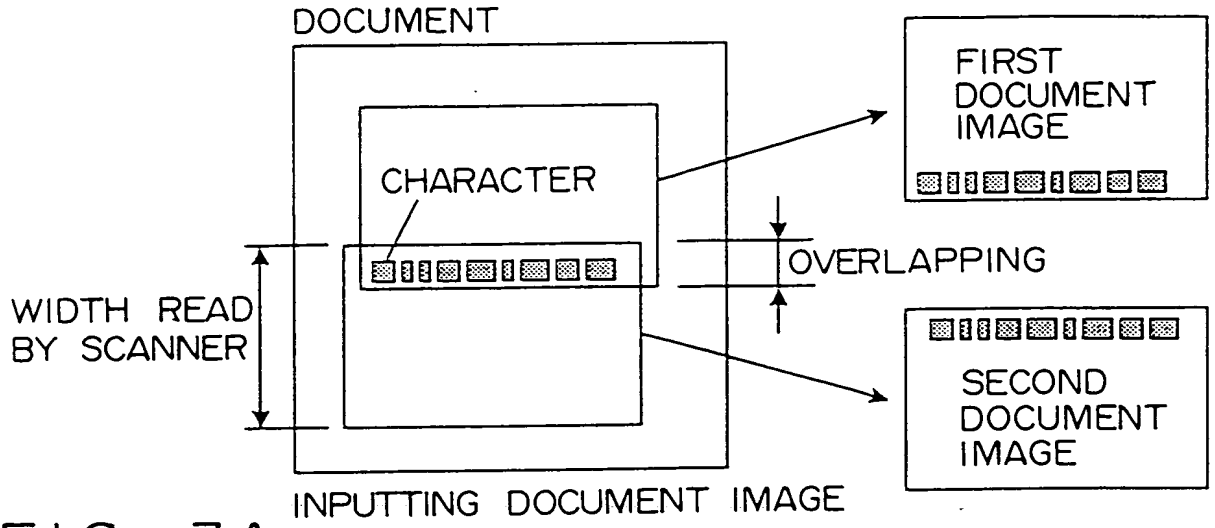


FIG. 3A

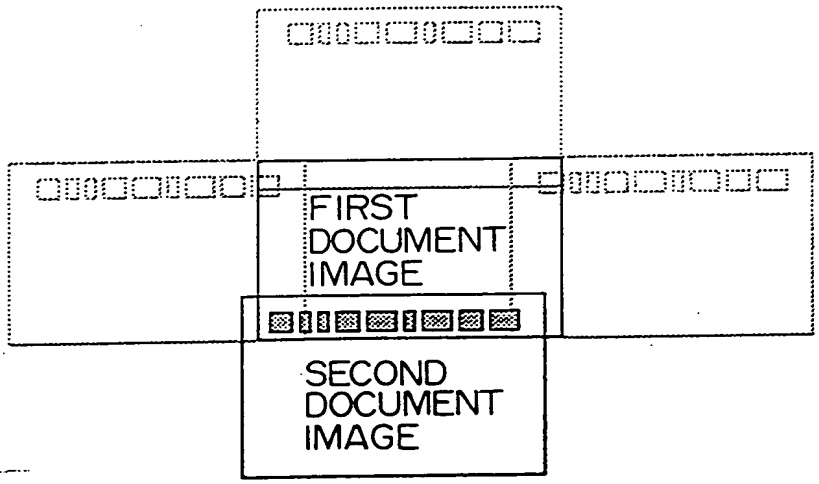


FIG. 3B

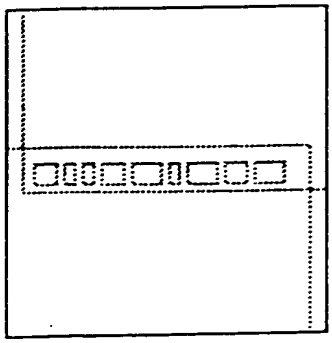


FIG. 3C

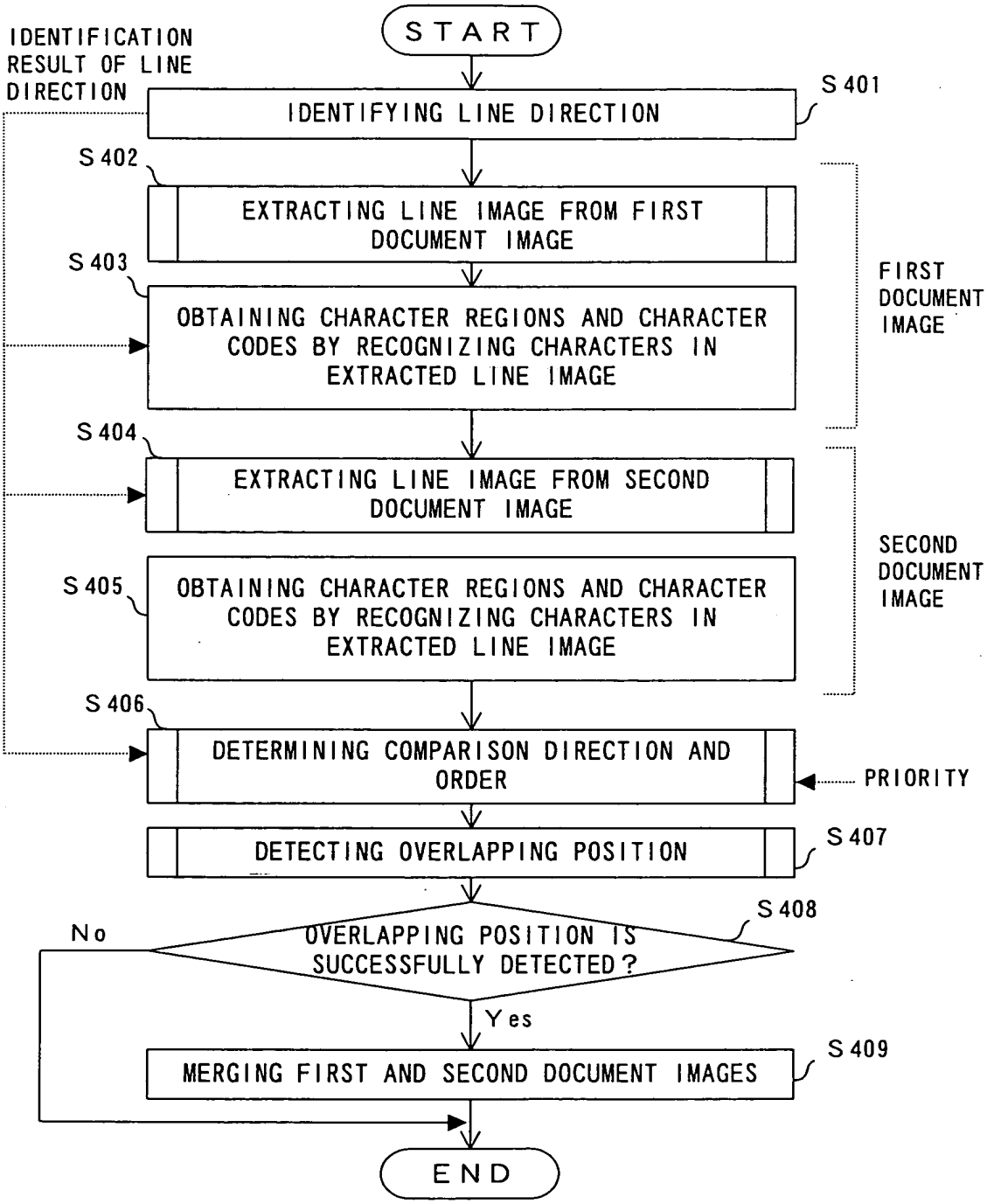

START
IDENTIFICATION RESULT OF LINE DIRECTION
IDENTIFYING LINE DIRECTION
S401
S402
EXTRACTING LINE IMAGE FROM FIRST DOCUMENT IMAGE
S403
OBTAINING CHARACTER REGIONS AND CHARACTER CODES BY RECOGNIZING CHARACTERS IN EXTRACTED LINE IMAGE
FIRST DOCUMENT IMAGE
S404
EXTRACTING LINE IMAGE FROM SECOND DOCUMENT IMAGE
S405
OBTAINING CHARACTER REGIONS AND CHARACTER CODES BY RECOGNIZING CHARACTERS IN EXTRACTED LINE IMAGE
SECOND DOCUMENT IMAGE
S406
DETERMINING COMPARISON DIRECTION AND ORDER
PRIORITY
DETECTING OVERLAPPING POSITION
S407
S408
No
OVERLAPPING POSITION IS SUCCESSFULLY DETECTED?
Yes
S409
MERGING FIRST AND SECOND DOCUMENT IMAGES
END

FIG. 4

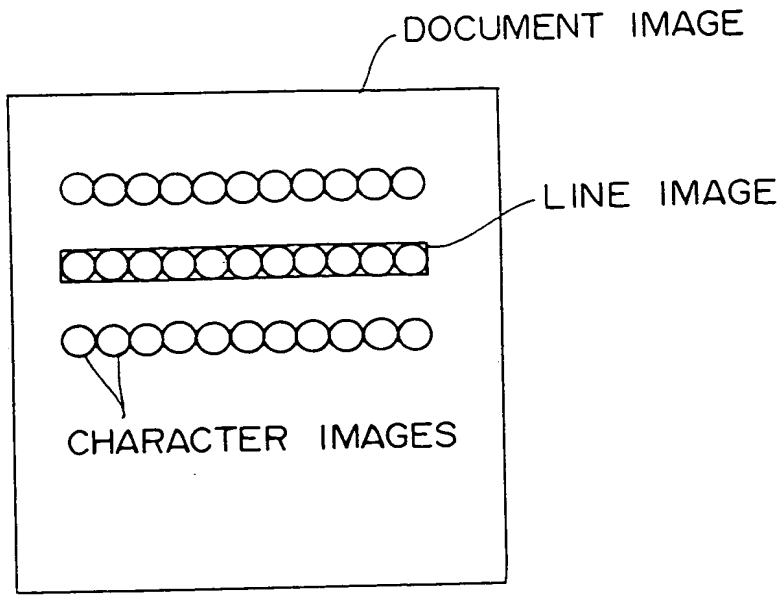


FIG. 5

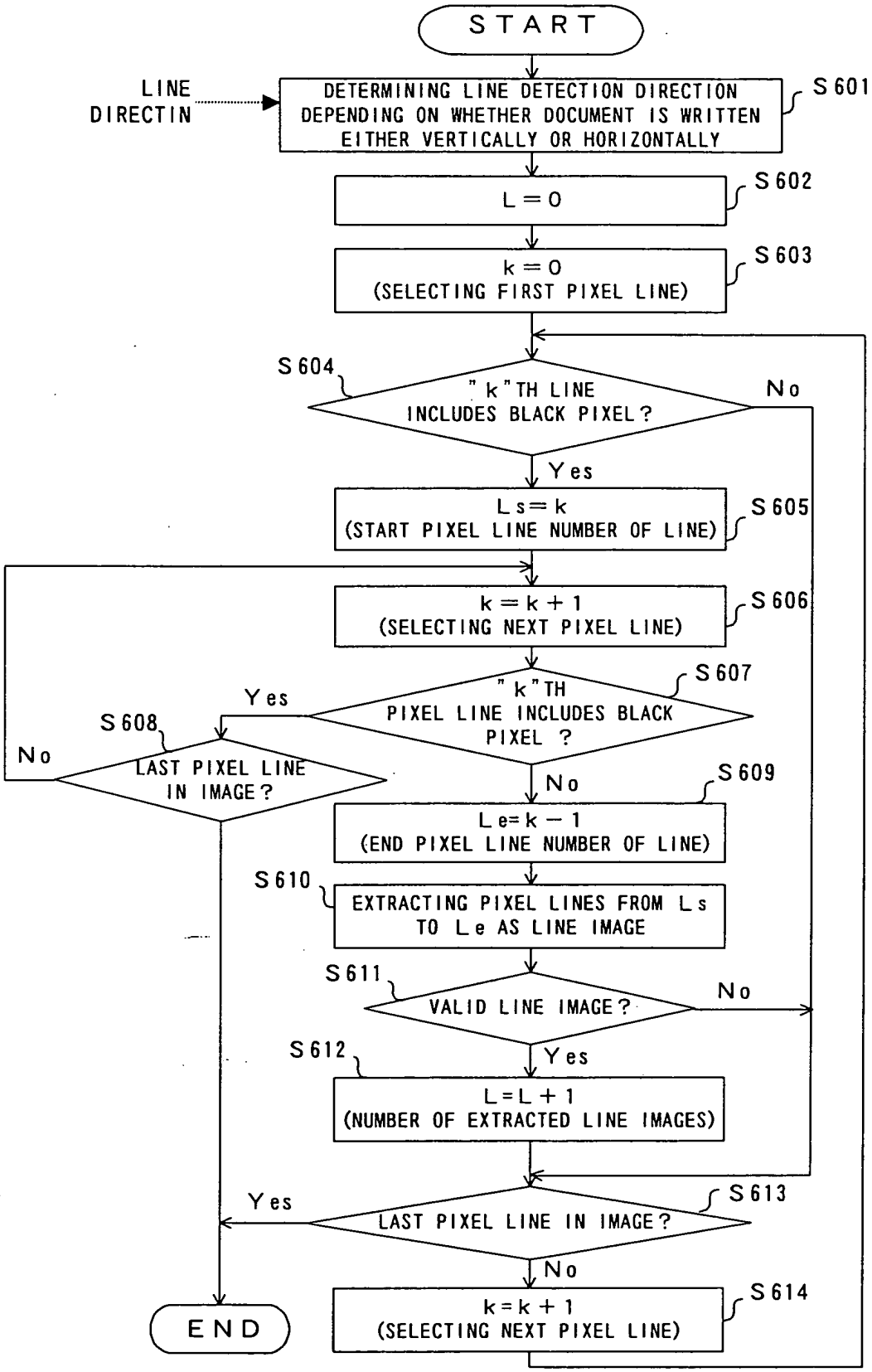

START
LINE DIRECTIN
DETERMINING LINE DETECTION DIRECTION DEPENDING ON WHETHER DOCUMENT IS WRITTEN EITHER VERTICALLY OR HORIZONTALLY
S601
L = 0
S602
k = 0 (SELECTING FIRST PIXEL LINE)
S603
S604
" k " TH LINE INCLUDES BLACK PIXEL ?
No
Yes
Ls = k (START PIXEL LINE NUMBER OF LINE)
S605
k = k + 1 (SELECTING NEXT PIXEL LINE)
S606
S607
" k " TH PIXEL LINE INCLUDES BLACK PIXEL ?
Yes
S608
No
LAST PIXEL LINE IN IMAGE ?
No
S609
Le = k − 1 (END PIXEL LINE NUMBER OF LINE)
S610
EXTRACTING PIXEL LINES FROM Ls TO Le AS LINE IMAGE
S611
VALID LINE IMAGE ?
No
S612
Yes
L = L + 1 (NUMBER OF EXTRACTED LINE IMAGES)
S613
Yes
LAST PIXEL LINE IN IMAGE ?
No
S614
k = k + 1 (SELECTING NEXT PIXEL LINE)
END

FIG. 6

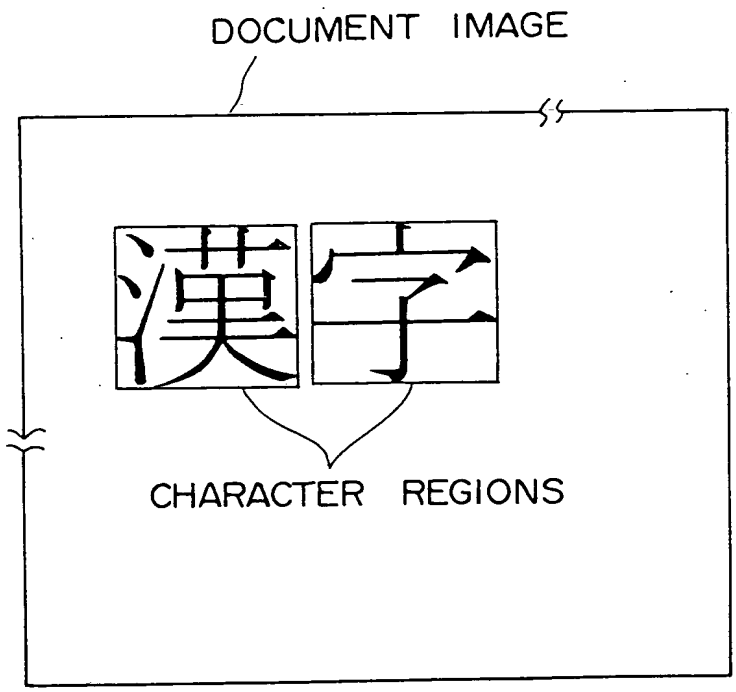
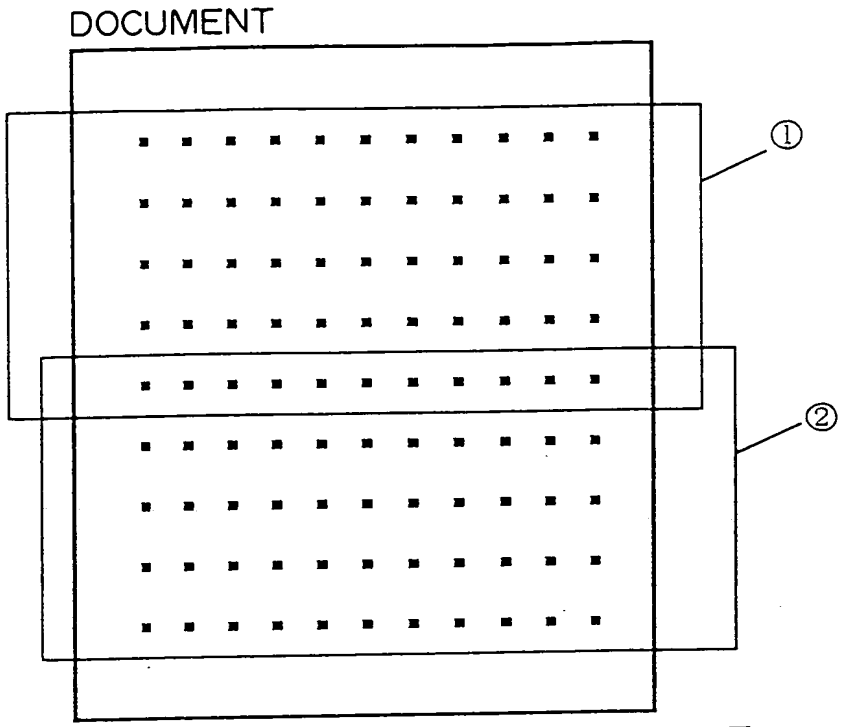
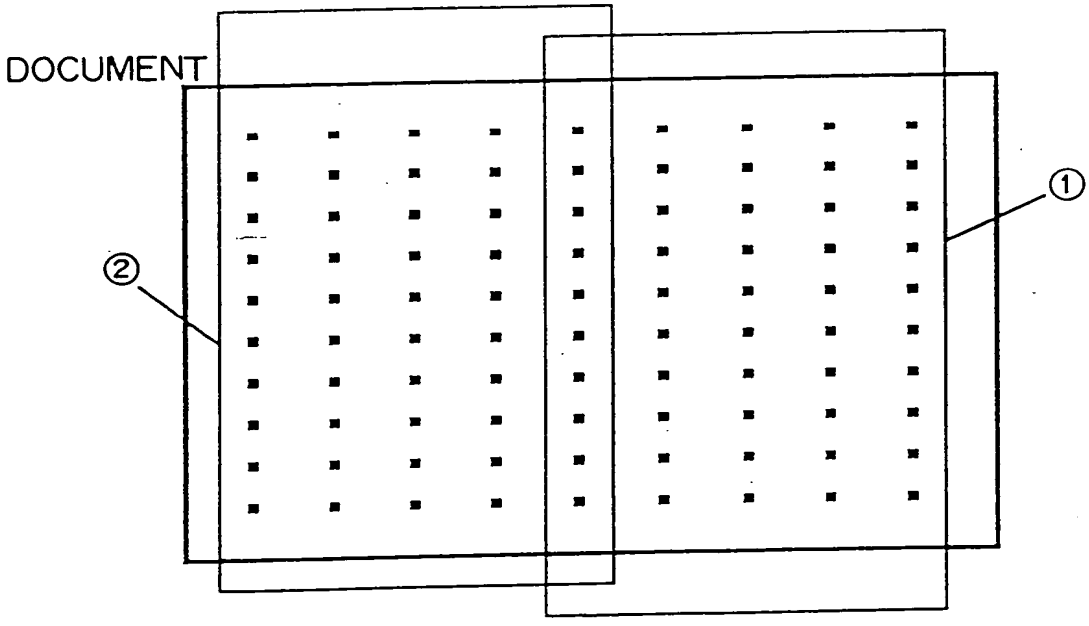


FIG. 7



HORIZONTALLY WRITTEN DOCUMENT

FIG. 8A



VERTICALLY WRITTEN DOCUMENT

FIG. 8B

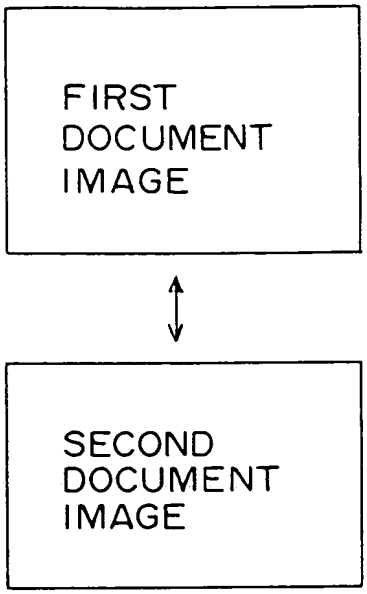


FIG. 9A

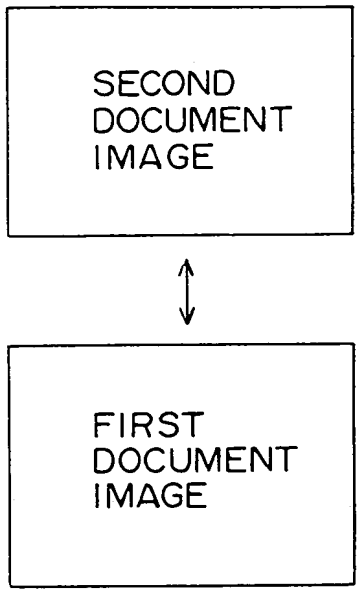


FIG. 9B

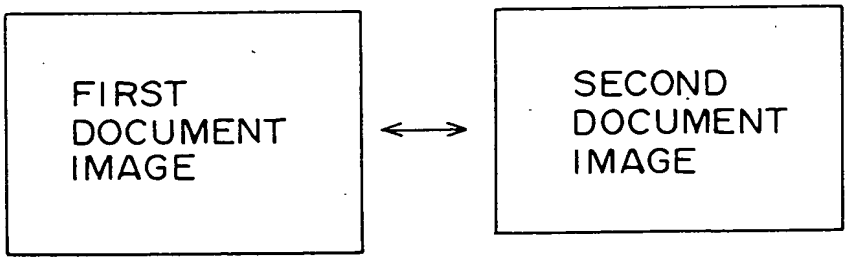


FIG. 9C

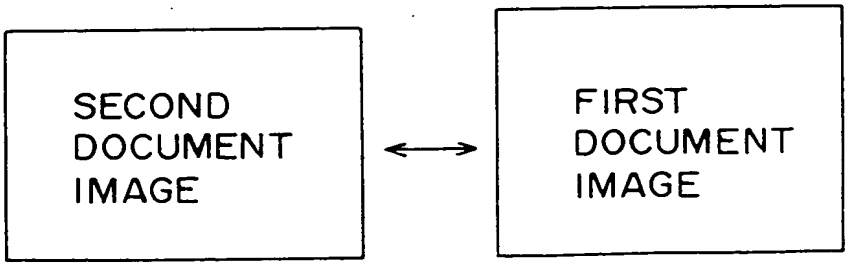
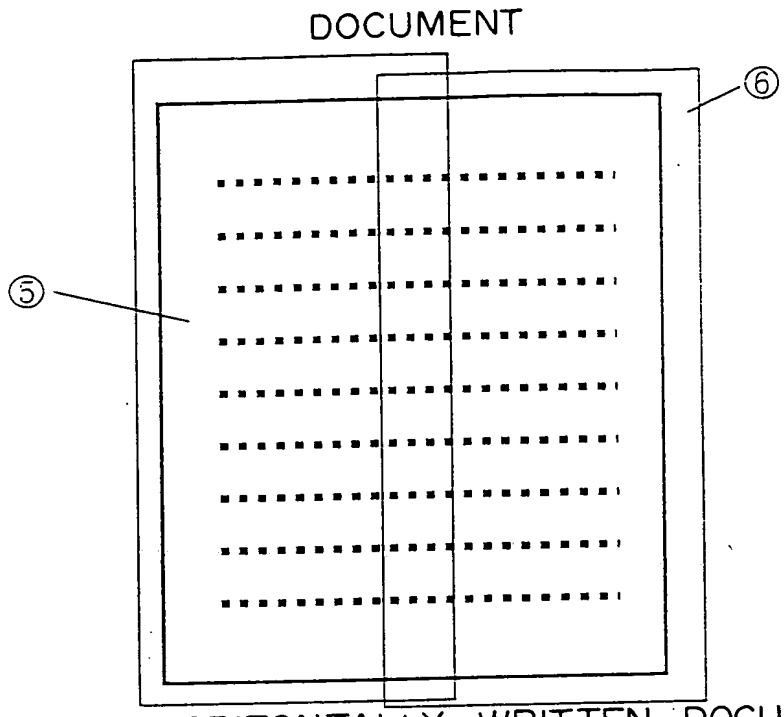
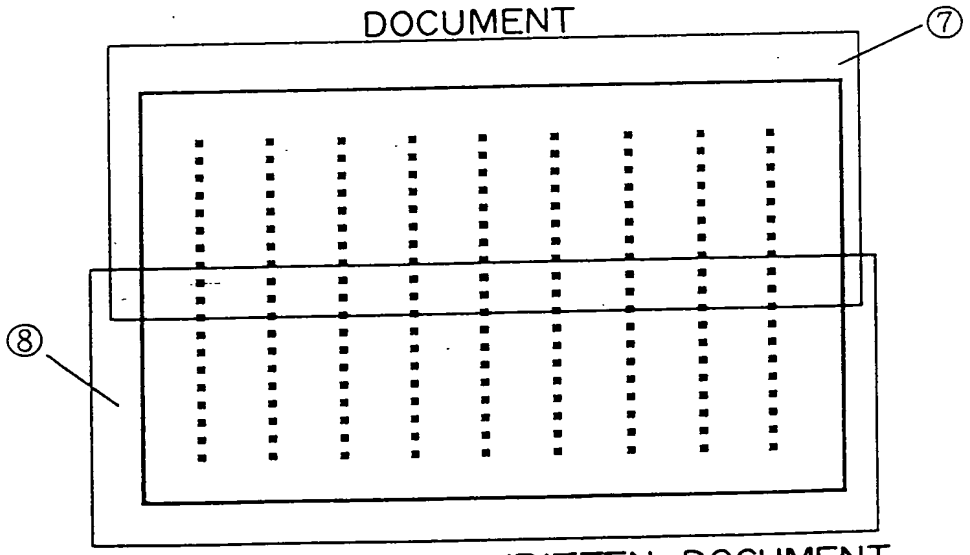


FIG. 9D



WHEN HORIZONTALLY WRITTEN DOCUMENT IS SCANNED IN VERTICAL DIRECTION

FIG. 10A



WHEN VERTICALLY WRITTEN DOCUMENT IS SCANNED IN HORIZONTAL DIRECTION

FIG. 10B

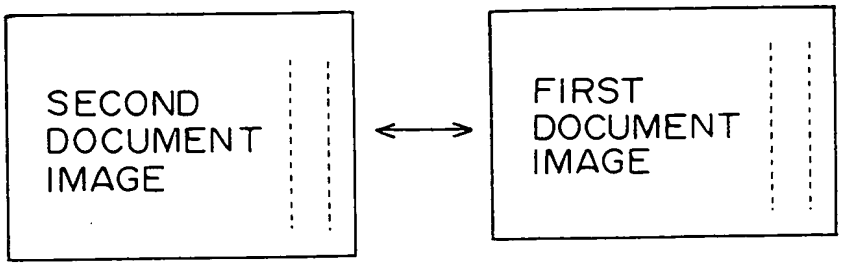


FIG. 11A

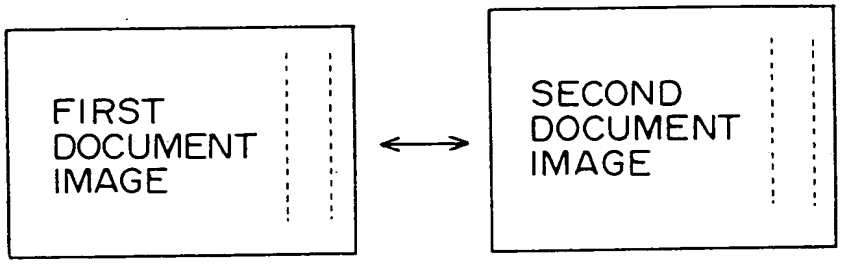


FIG. 11B

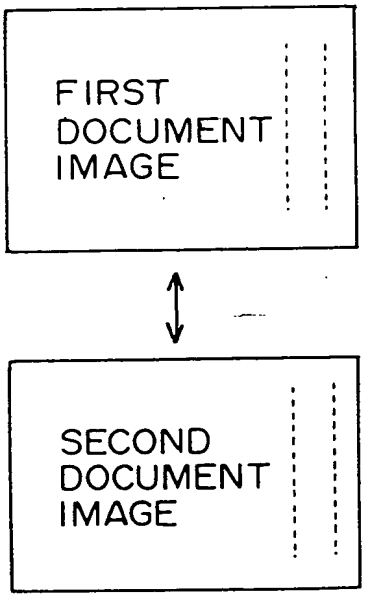


FIG. 11C

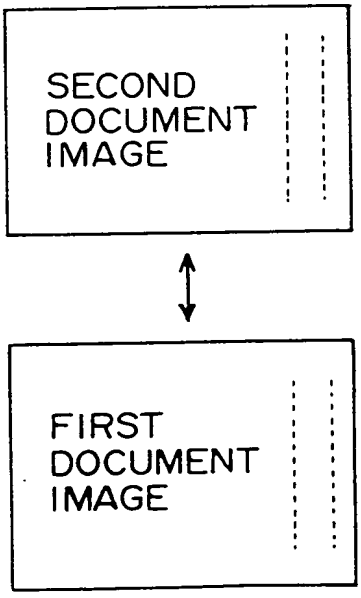


FIG. 11D

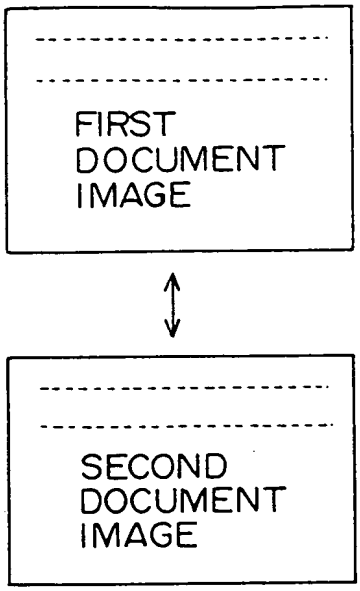


FIG. 12A

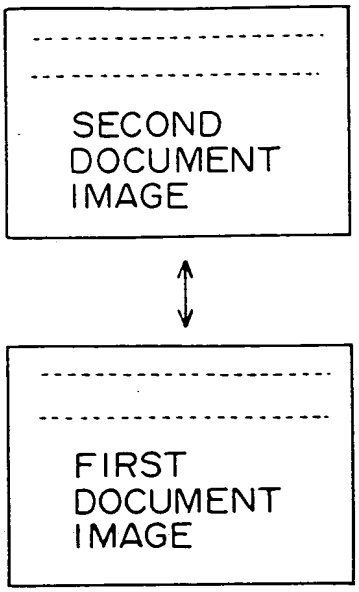


FIG. 12B

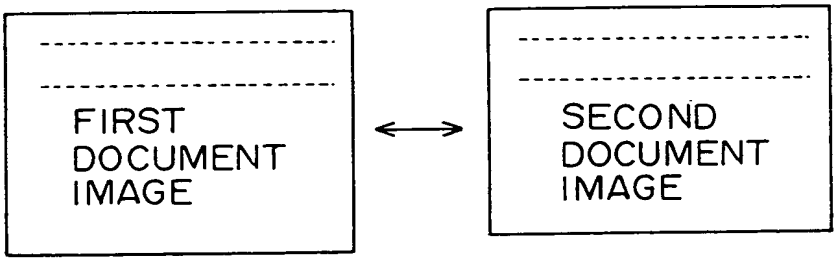


FIG. 12C

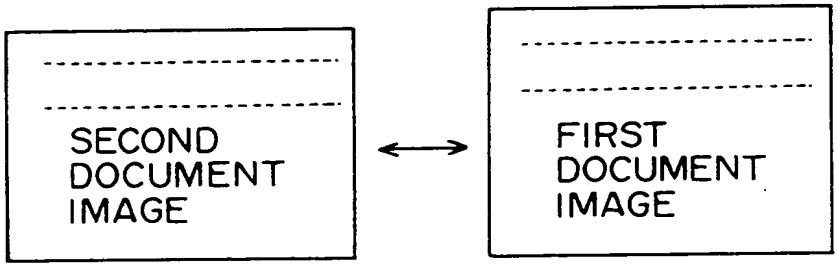


FIG. 12D

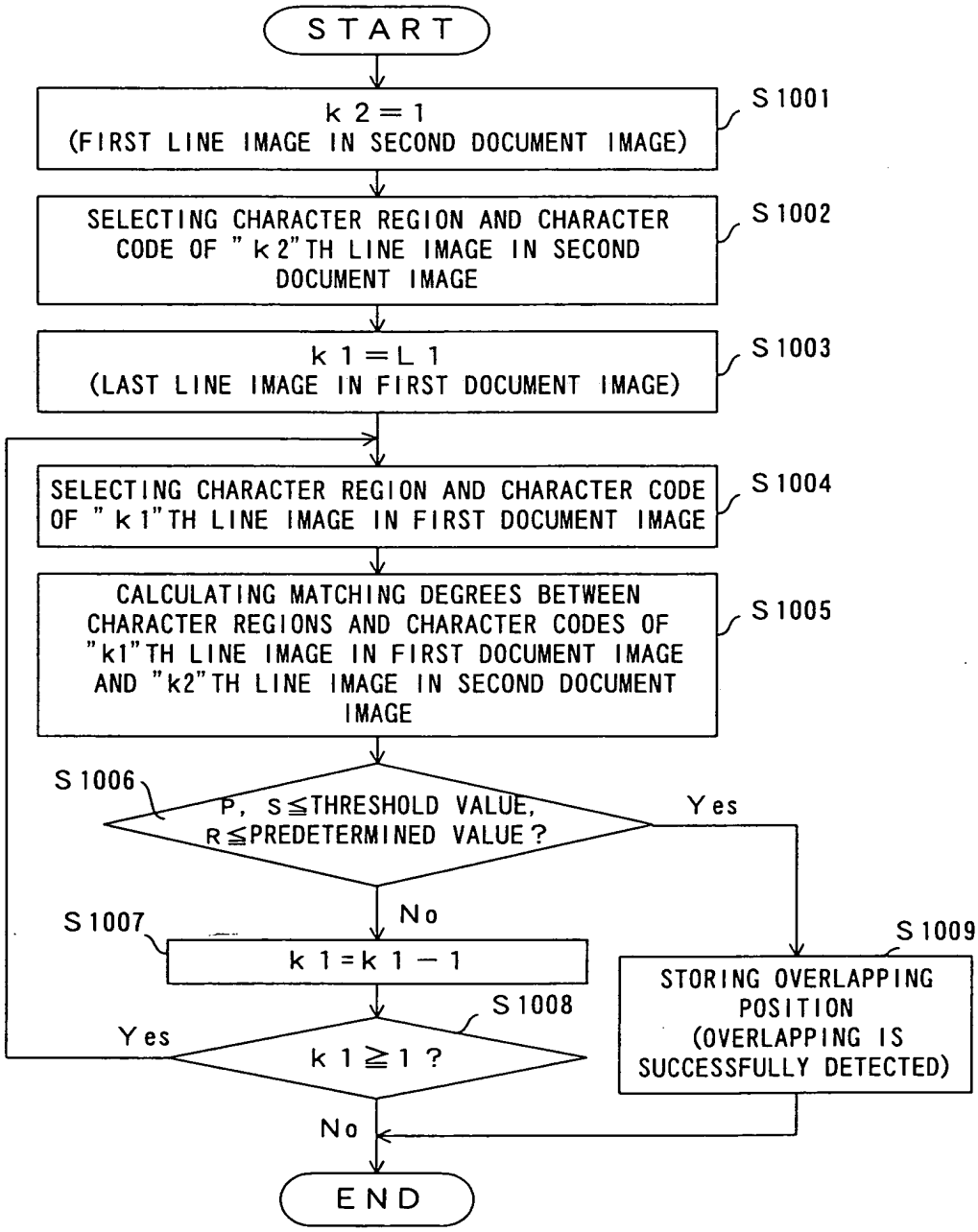

START
k 2 = 1
(FIRST LINE IMAGE IN SECOND DOCUMENT IMAGE)
S 1001
SELECTING CHARACTER REGION AND CHARACTER CODE OF " k 2"TH LINE IMAGE IN SECOND DOCUMENT IMAGE
S 1002
k 1 = L 1
(LAST LINE IMAGE IN FIRST DOCUMENT IMAGE)
S 1003
SELECTING CHARACTER REGION AND CHARACTER CODE OF " k 1"TH LINE IMAGE IN FIRST DOCUMENT IMAGE
S 1004
CALCULATING MATCHING DEGREES BETWEEN CHARACTER REGIONS AND CHARACTER CODES OF "k1"TH LINE IMAGE IN FIRST DOCUMENT IMAGE AND "k2"TH LINE IMAGE IN SECOND DOCUMENT IMAGE
S 1005
S 1006
P, S≦THRESHOLD VALUE, R≦PREDETERMINED VALUE ?
Yes
No
S 1007
k 1 = k 1 − 1
S 1008
Yes
k 1 ≧ 1 ?
No
S 1009
STORING OVERLAPPING POSITION (OVERLAPPING IS SUCCESSFULLY DETECTED)
END

FIG. 13

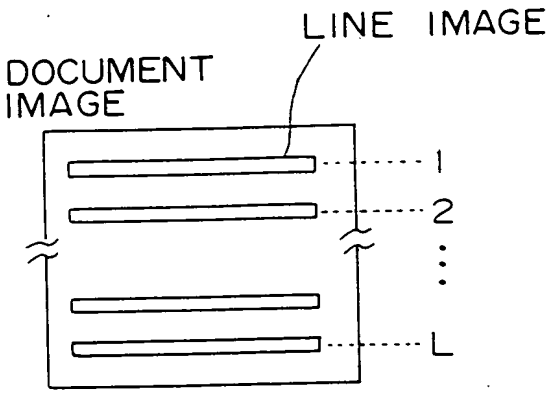


FIG. 14A

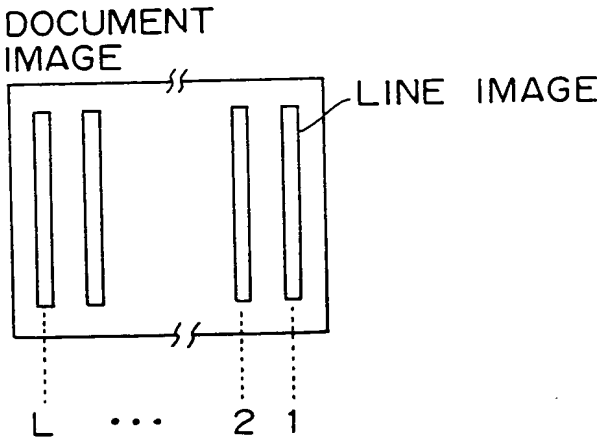


FIG. 14B

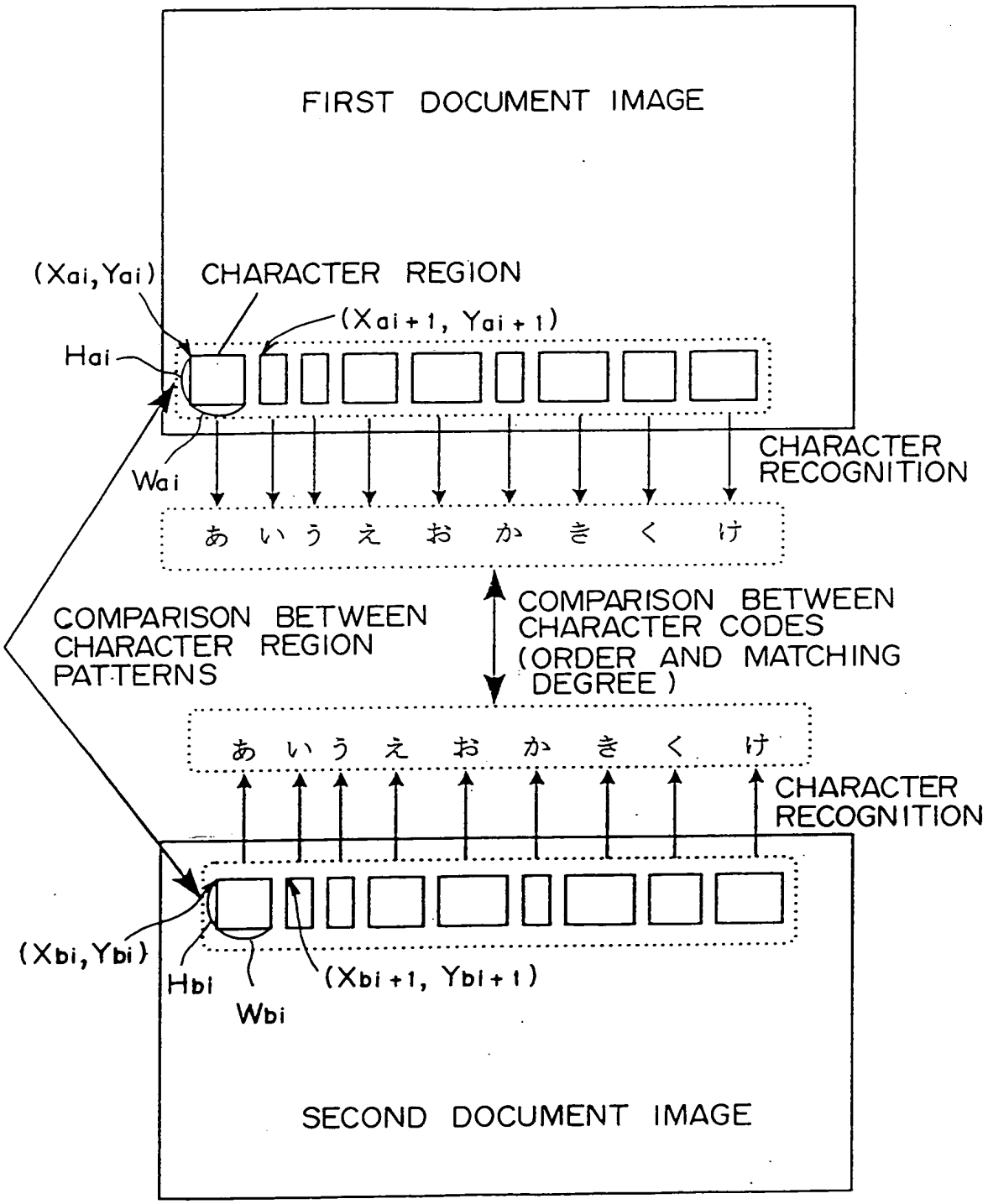

FIRST DOCUMENT IMAGE
(Xai, Yai)
CHARACTER REGION
(Xai+1, Yai+1)
Hai
Wai
CHARACTER RECOGNITION
あ い う え お か き く け
COMPARISON BETWEEN CHARACTER REGION PATTERNS
COMPARISON BETWEEN CHARACTER CODES (ORDER AND MATCHING DEGREE)
あ い う え お か き く け
CHARACTER RECOGNITION
(Xbi, Ybi)
Hbi
Wbi
(Xbi+1, Ybi+1)
SECOND DOCUMENT IMAGE

FIG. 15

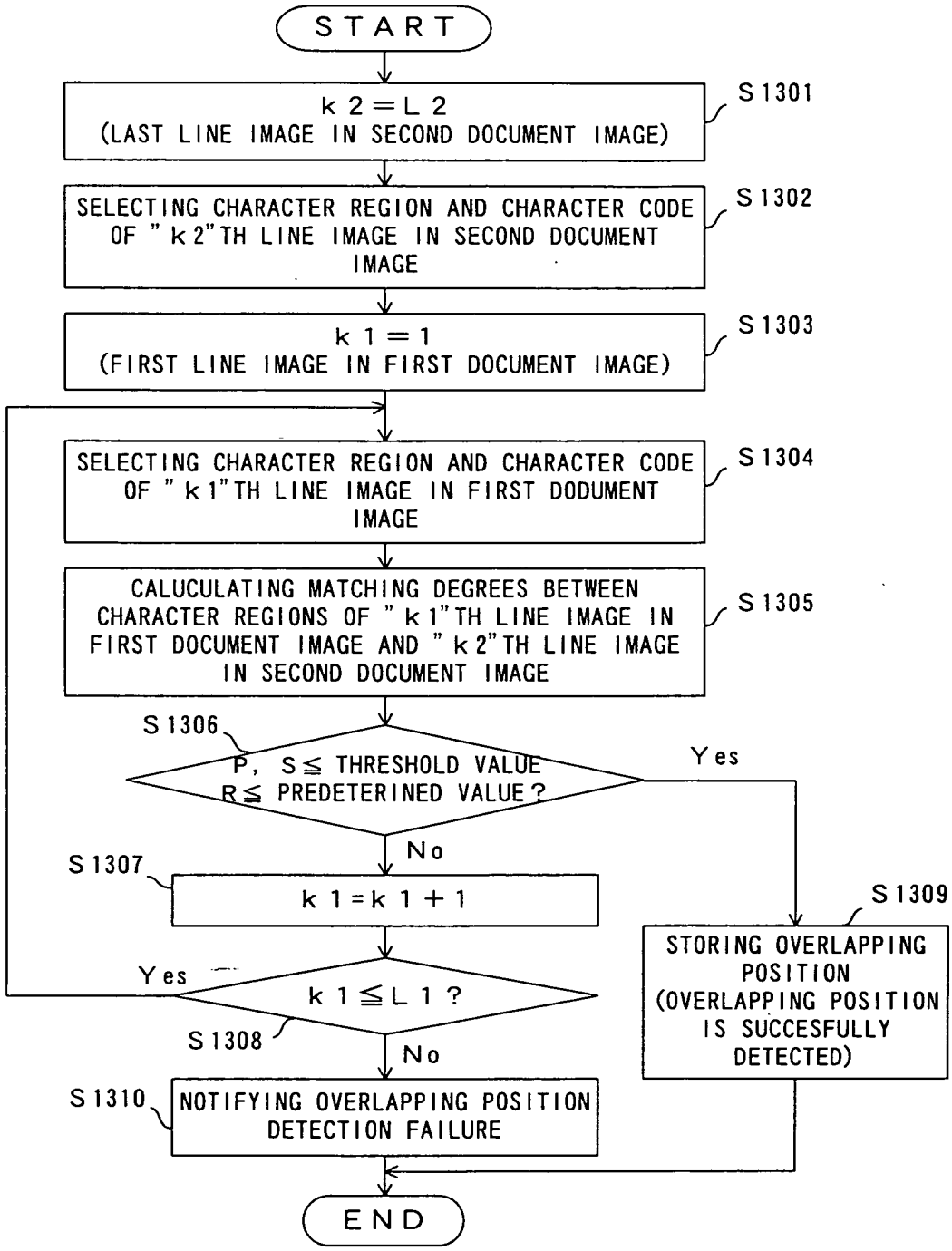

START
k 2 = L 2
(LAST LINE IMAGE IN SECOND DOCUMENT IMAGE)
S 1301
SELECTING CHARACTER REGION AND CHARACTER CODE OF " k 2"TH LINE IMAGE IN SECOND DOCUMENT IMAGE
S 1302
k 1 = 1
(FIRST LINE IMAGE IN FIRST DOCUMENT IMAGE)
S 1303
SELECTING CHARACTER REGION AND CHARACTER CODE OF " k 1"TH LINE IMAGE IN FIRST DODUMENT IMAGE
S 1304
CALUCULATING MATCHING DEGREES BETWEEN CHARACTER REGIONS OF " k 1"TH LINE IMAGE IN FIRST DOCUMENT IMAGE AND " k 2"TH LINE IMAGE IN SECOND DOCUMENT IMAGE
S 1305
S 1306
P, S ≦ THRESHOLD VALUE
R ≦ PREDETERINED VALUE ?
Yes
No
S 1307
k 1 = k 1 + 1
S 1309
STORING OVERLAPPING POSITION (OVERLAPPING POSITION IS SUCCESFULLY DETECTED)
Yes
k 1 ≦ L 1 ?
S 1308
No
S 1310
NOTIFYING OVERLAPPING POSITION DETECTION FAILURE
END

FIG. 16

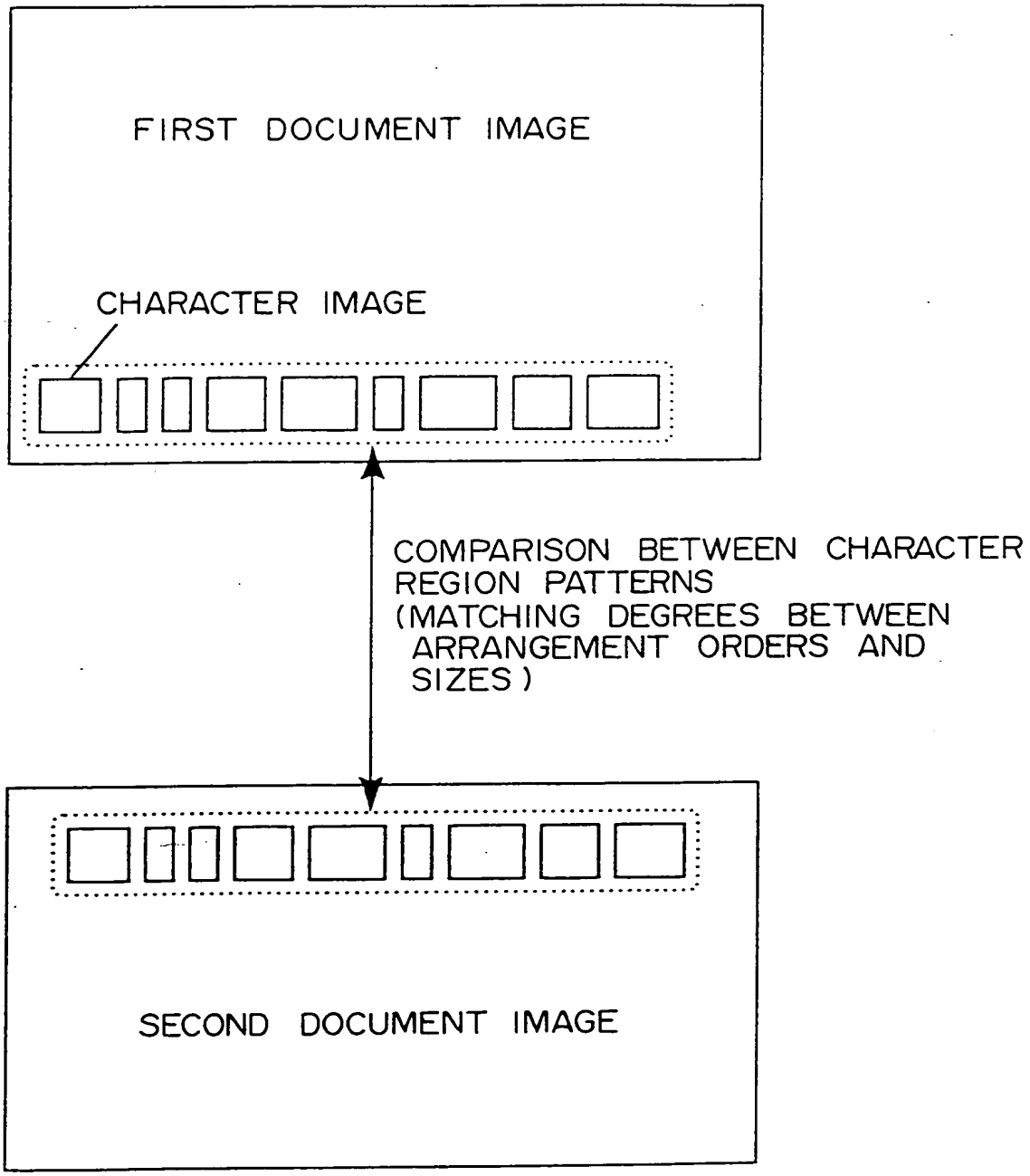

FIRST DOCUMENT IMAGE
CHARACTER IMAGE
COMPARISON BETWEEN CHARACTER REGION PATTERNS (MATCHING DEGREES BETWEEN ARRANGEMENT ORDERS AND SIZES)
SECOND DOCUMENT IMAGE

FIG. 17

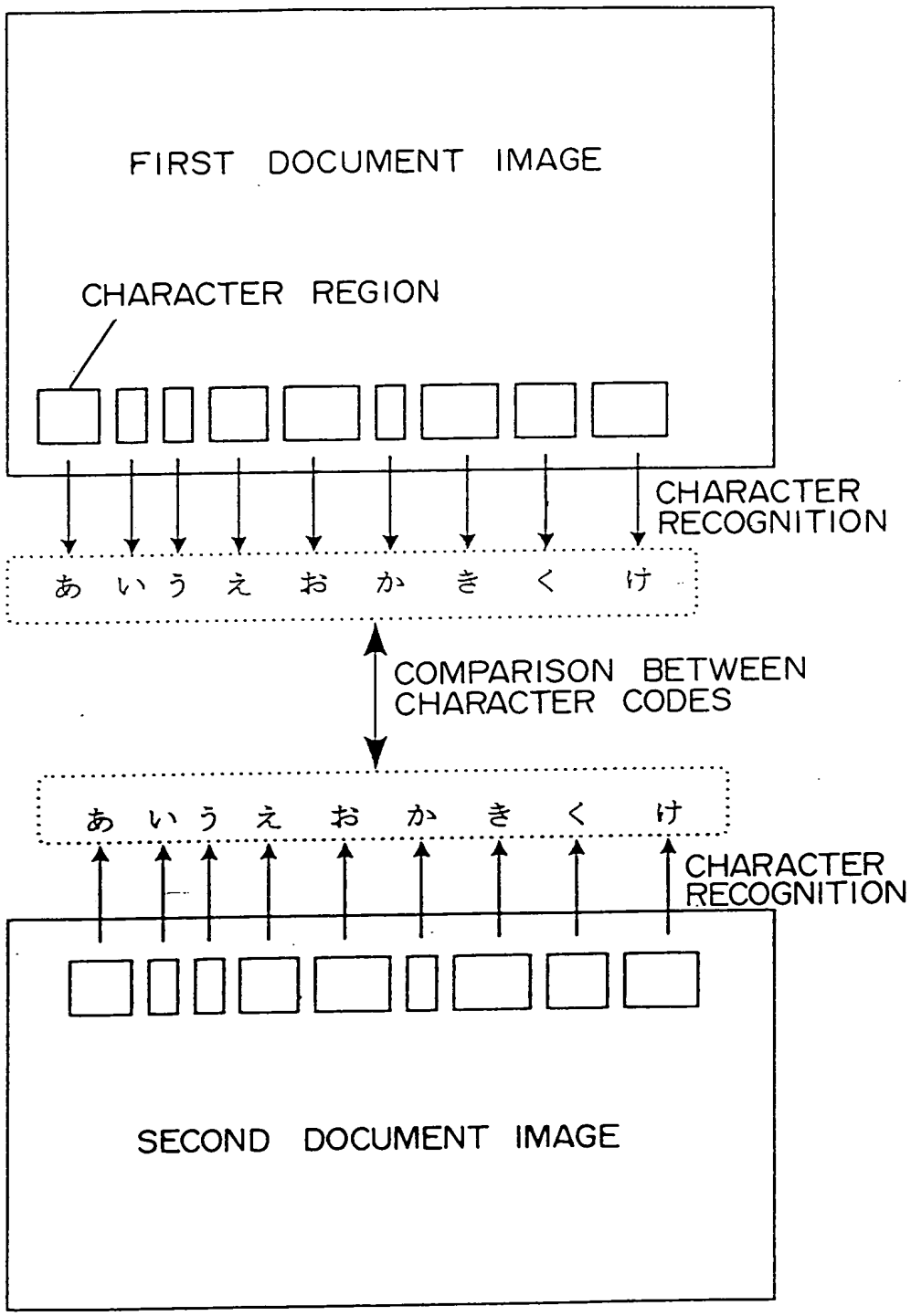

FIRST DOCUMENT IMAGE
CHARACTER REGION
CHARACTER RECOGNITION
あ い う え お か き く け
COMPARISON BETWEEN CHARACTER CODES
あ い う え お か き く け
CHARACTER RECOGNITION
SECOND DOCUMENT IMAGE

FIG. 18

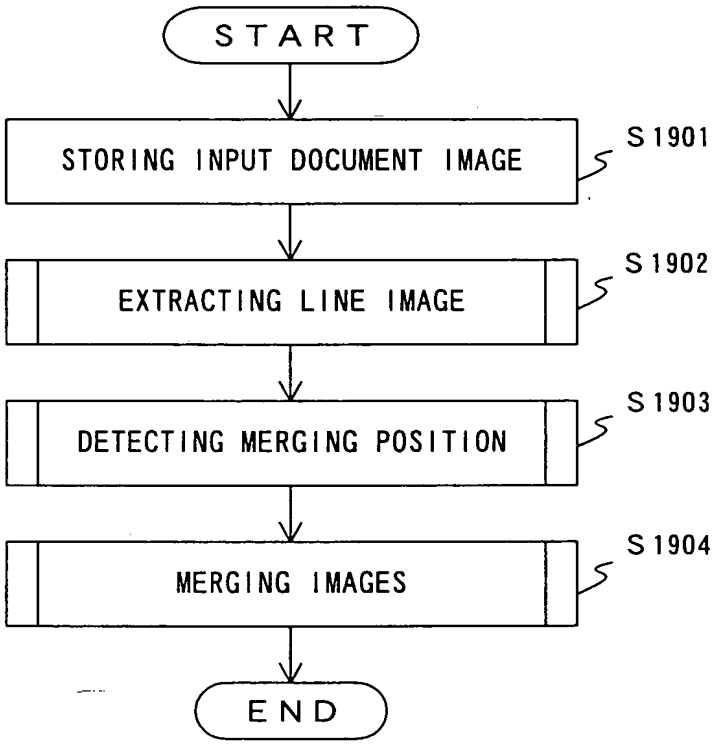

START
STORING INPUT DOCUMENT IMAGE
S1901
EXTRACTING LINE IMAGE
S1902
DETECTING MERGING POSITION
S1903
MERGING IMAGES
S1904
END

FIG. 19

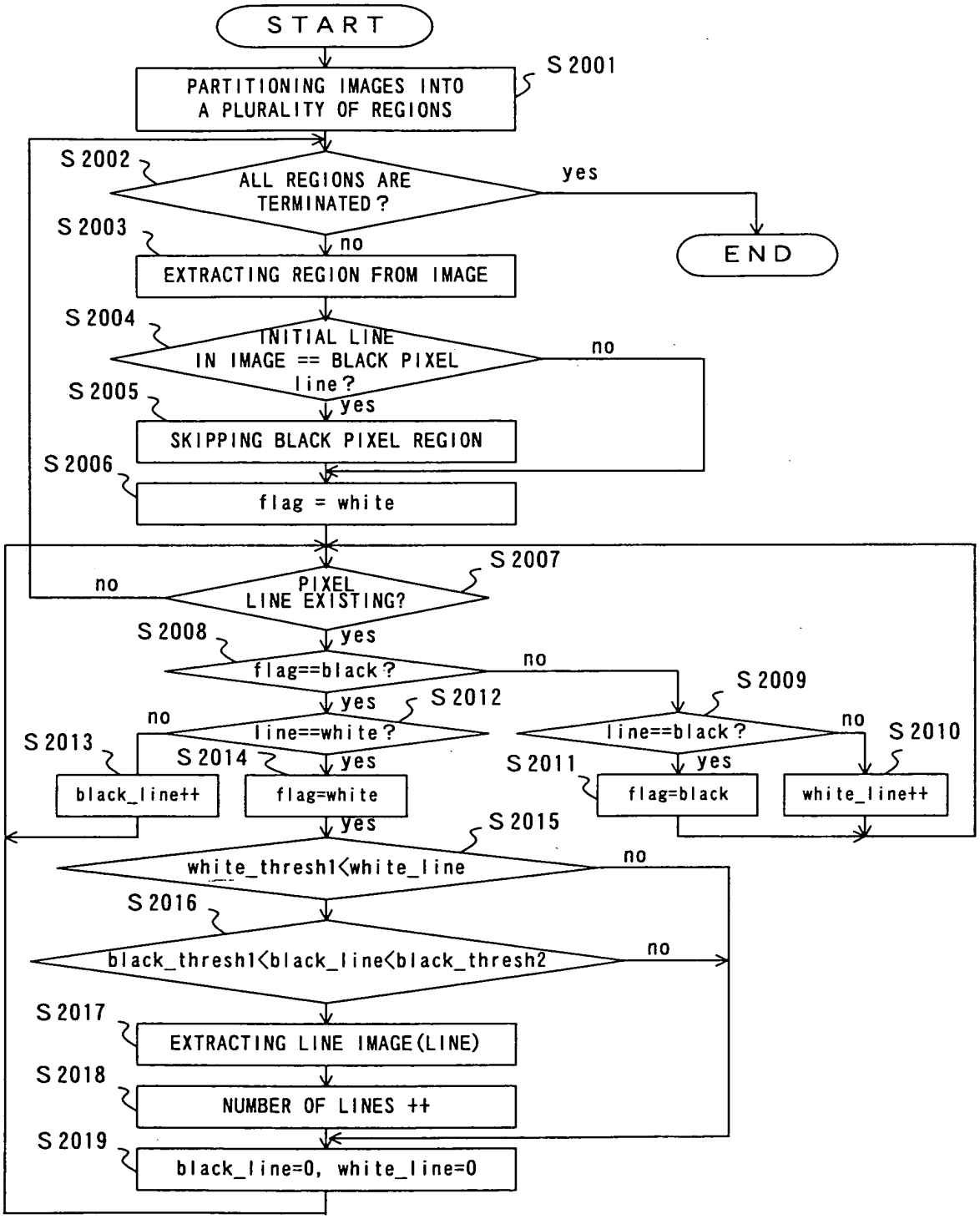

START
S 2001
PARTITIONING IMAGES INTO A PLURALITY OF REGIONS
S 2002
ALL REGIONS ARE TERMINATED ?
yes
END
no
S 2003
EXTRACTING REGION FROM IMAGE
S 2004
INITIAL LINE IN IMAGE == BLACK PIXEL line ?
no
yes
S 2005
SKIPPING BLACK PIXEL REGION
S 2006
flag = white
S 2007
PIXEL LINE EXISTING?
no
yes
S 2008
flag==black ?
no
yes
S 2009
line==black ?
no
yes
S 2010
white_line++
S 2011
flag=black
S 2012
line==white ?
no
yes
S 2013
black_line++
S 2014
flag=white
yes
S 2015
white_thresh1<white_line
no
yes
S 2016
black_thresh1<black_line<black_thresh2
no
S 2017
EXTRACTING LINE IMAGE(LINE)
S 2018
NUMBER OF LINES ++
S 2019
black_line=0, white_line=0

FIG. 20

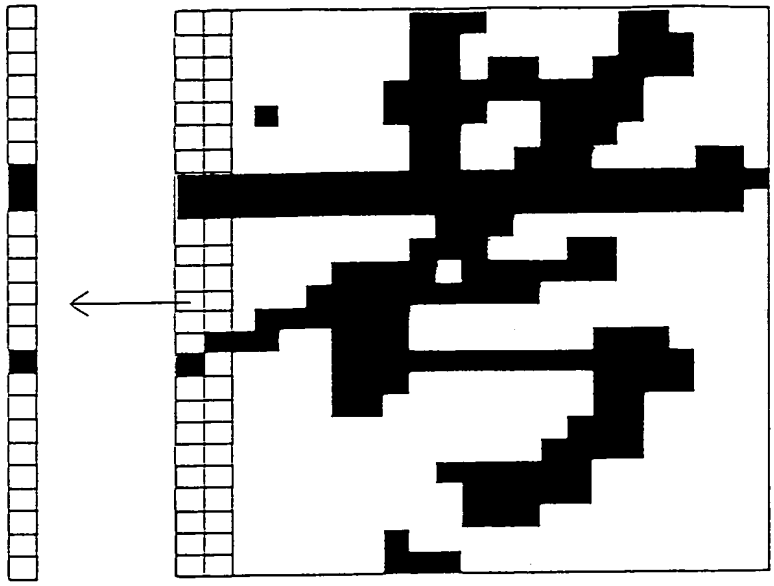


FIG. 21A

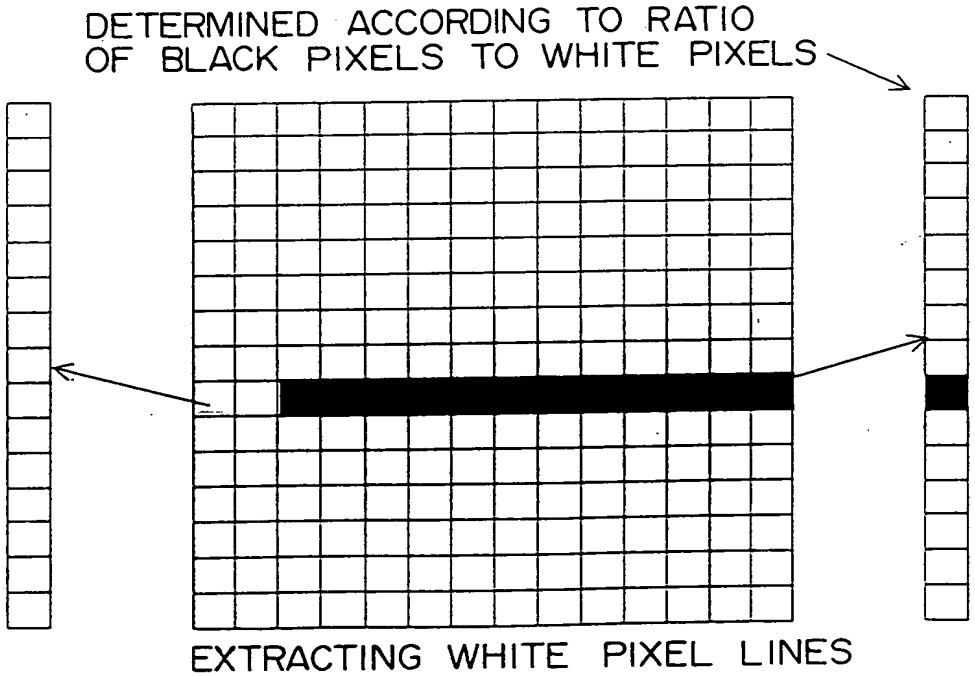


FIG. 21B

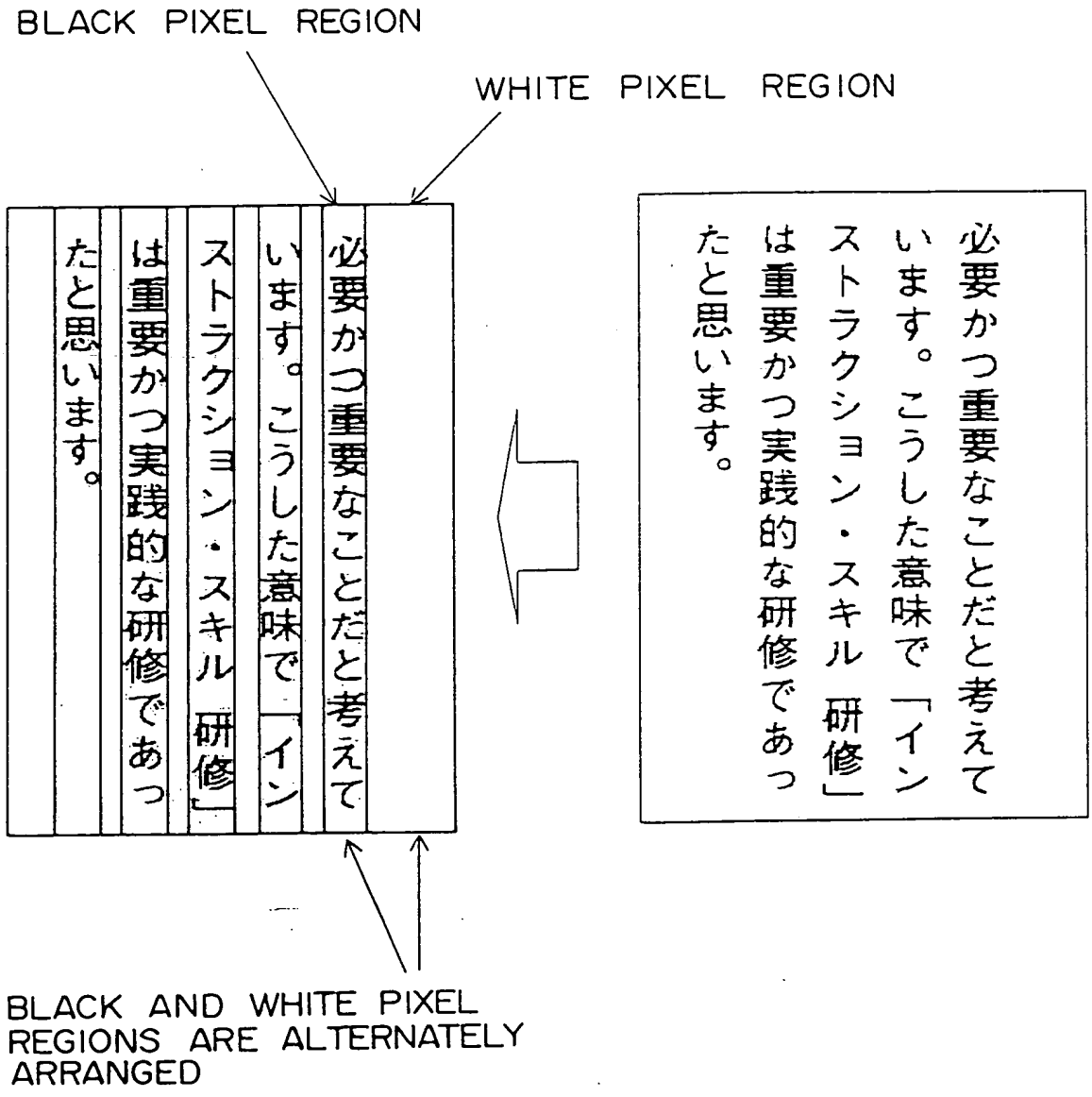

BLACK PIXEL REGION
WHITE PIXEL REGION
必要かつ重要なことだと考えています。こうした意味で「インストラクション・スキル 研修」は重要かつ実践的な研修であったと思います。
必要かつ重要なことだと考えています。こうした意味で「インストラクション・スキル 研修」は重要かつ実践的な研修であったと思います。
BLACK AND WHITE PIXEL REGIONS ARE ALTERNATELY ARRANGED

FIG. 22

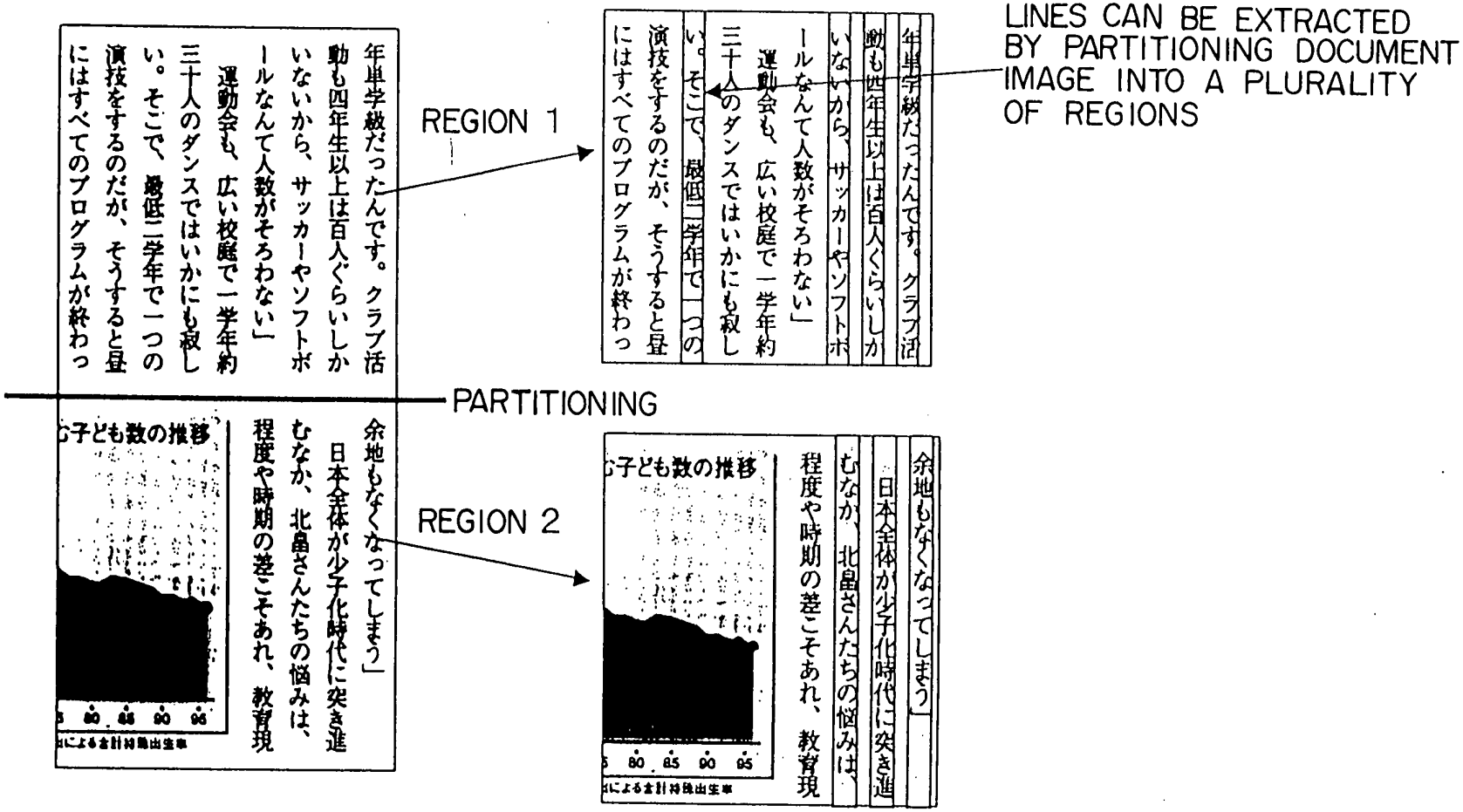

LINES CAN BE EXTRACTED BY PARTITIONING DOCUMENT IMAGE INTO A PLURALITY OF REGIONS
REGION 1
PARTITIONING
REGION 2

FIG. 23

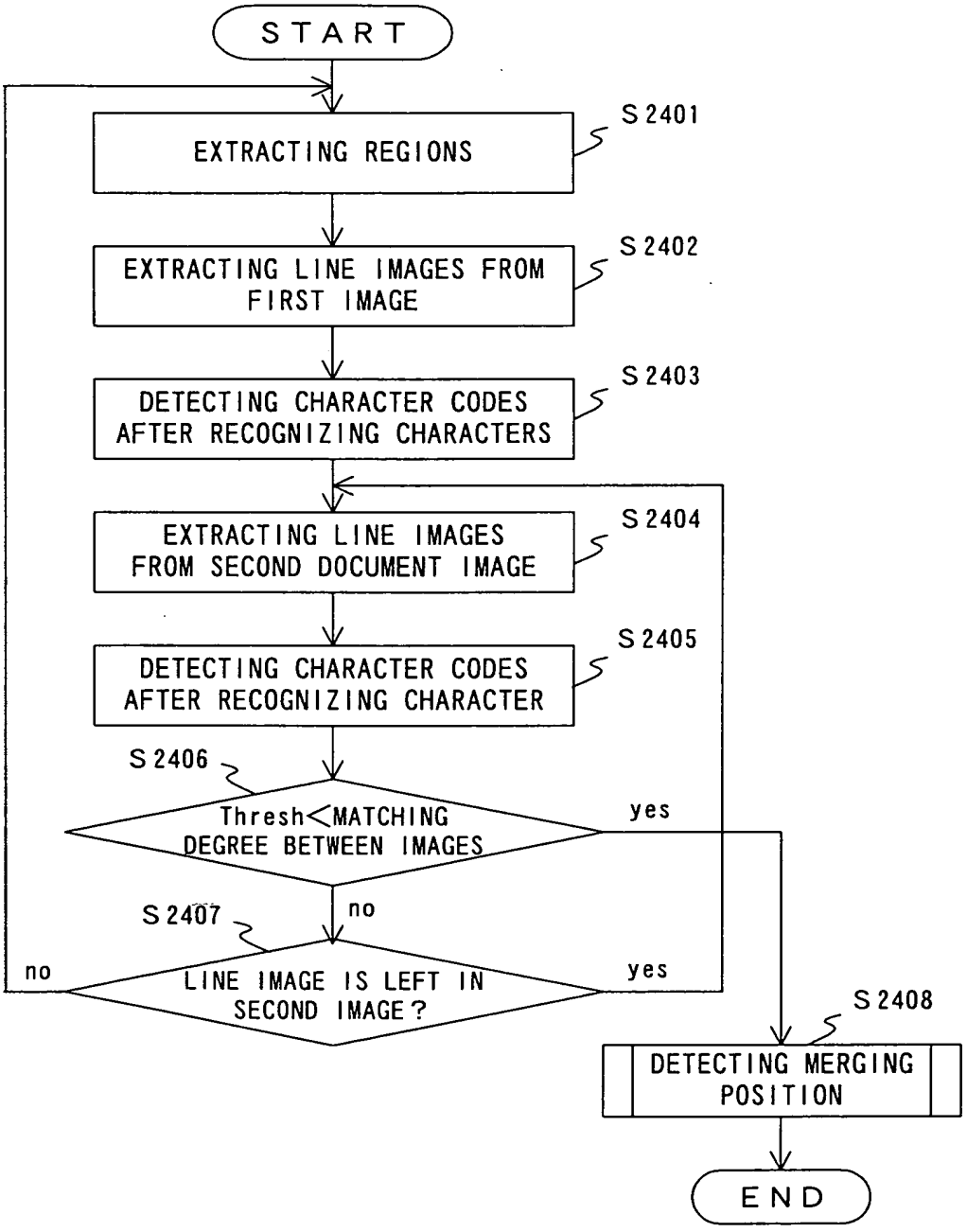

START
EXTRACTING REGIONS
S2401
EXTRACTING LINE IMAGES FROM FIRST IMAGE
S2402
DETECTING CHARACTER CODES AFTER RECOGNIZING CHARACTERS
S2403
EXTRACTING LINE IMAGES FROM SECOND DOCUMENT IMAGE
S2404
DETECTING CHARACTER CODES AFTER RECOGNIZING CHARACTER
S2405
S2406
Thresh<MATCHING DEGREE BETWEEN IMAGES
yes
no
S2407
LINE IMAGE IS LEFT IN SECOND IMAGE?
no
yes
S2408
DETECTING MERGING POSITION
END

FIG. 24

COMPARISON BETWEEN CODE NUMBERS AND ORDERS OF CHARACTER CODES

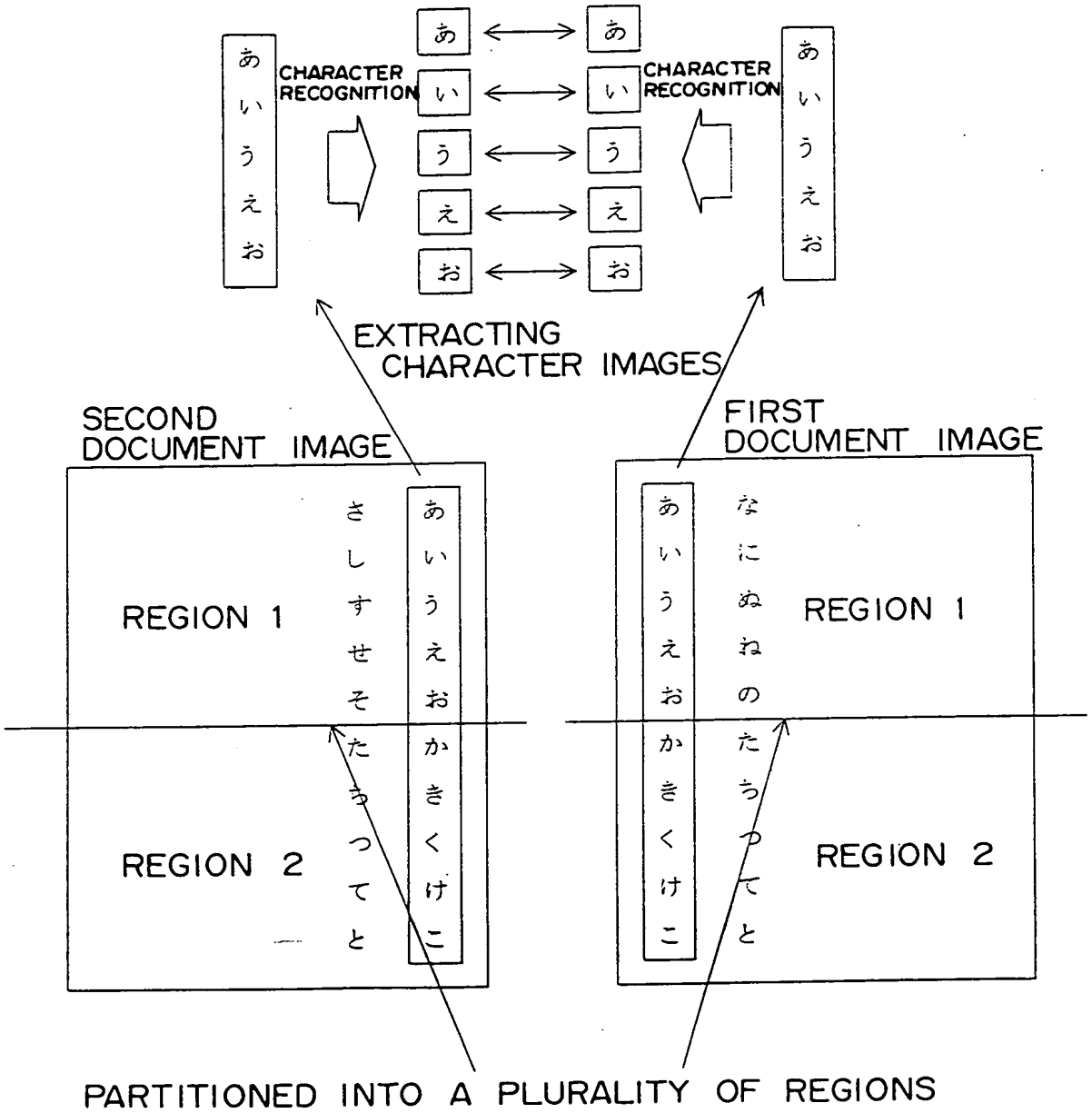


FIG. 25

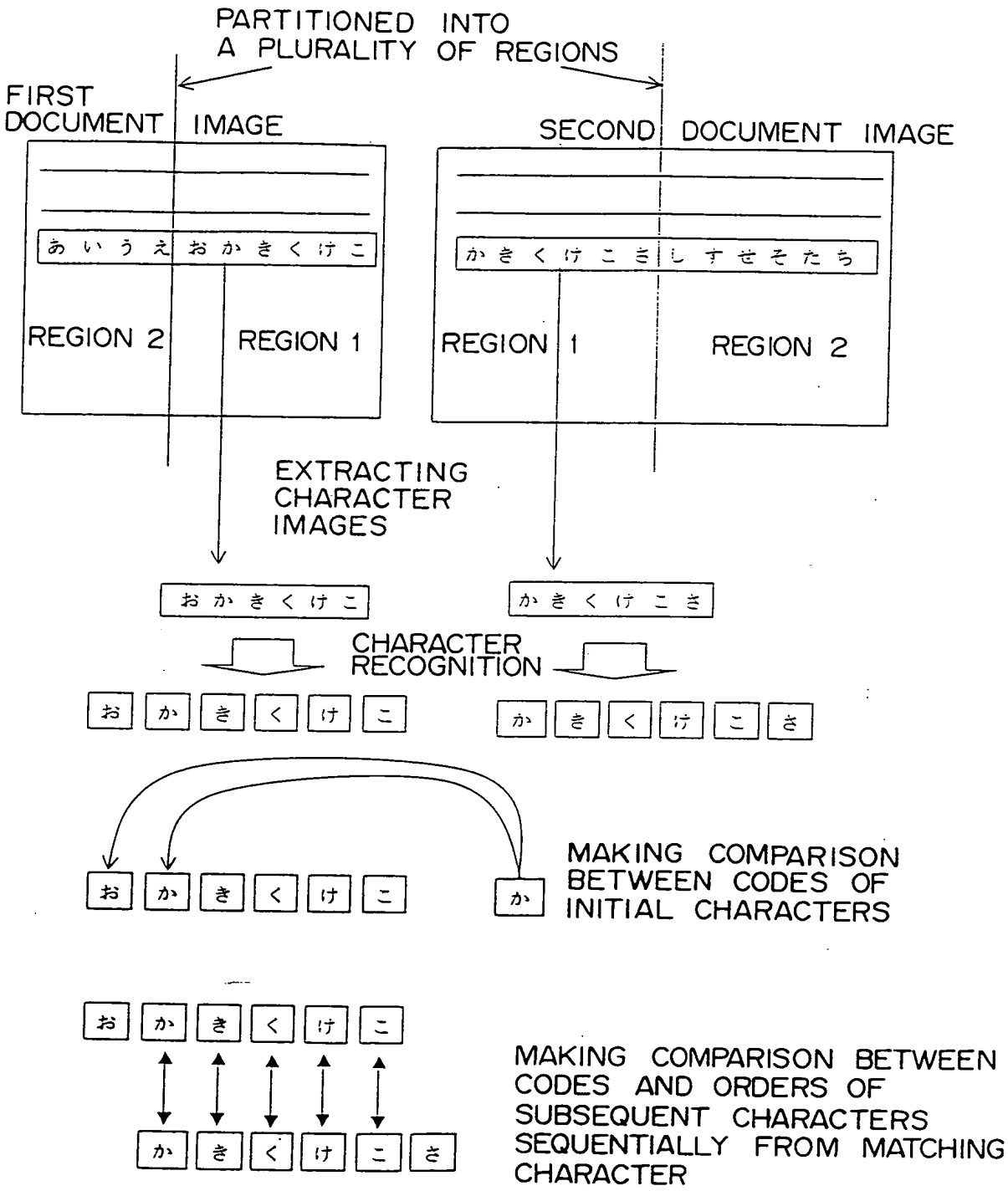

PARTITIONED INTO A PLURALITY OF REGIONS
FIRST DOCUMENT IMAGE
SECOND DOCUMENT IMAGE
あ い う え お か き く け こ
か き く け こ さ し す せ そ た ち
REGION 2
REGION 1
REGION 1
REGION 2
EXTRACTING CHARACTER IMAGES
お か き く け こ
か き く け こ さ
CHARACTER RECOGNITION
お か き く け こ
か き く け こ さ
お か き く け こ
か
MAKING COMPARISON BETWEEN CODES OF INITIAL CHARACTERS
お か き く け こ
か き く け こ さ
MAKING COMPARISON BETWEEN CODES AND ORDERS OF SUBSEQUENT CHARACTERS SEQUENTIALLY FROM MATCHING CHARACTER

FIG. 26

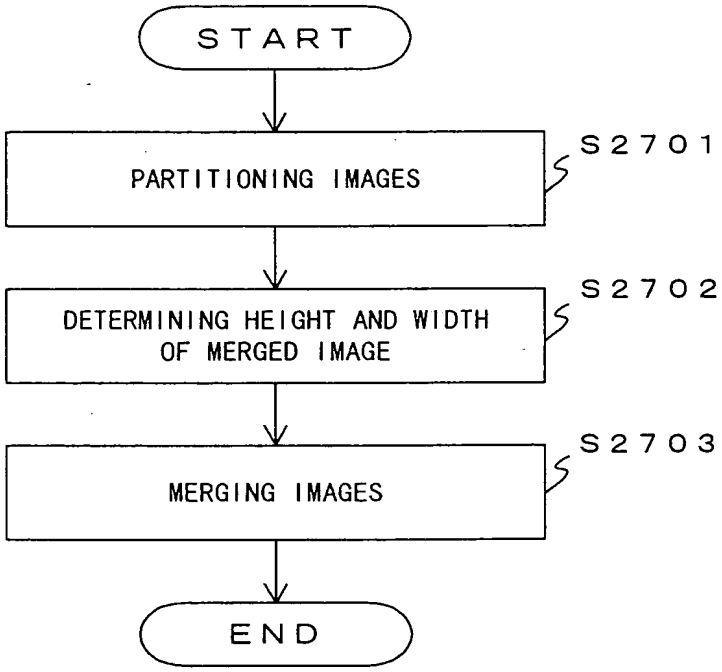

START
PARTITIONING IMAGES
S2701
DETERMINING HEIGHT AND WIDTH OF MERGED IMAGE
S2702
MERGING IMAGES
S2703
END

FIG. 27

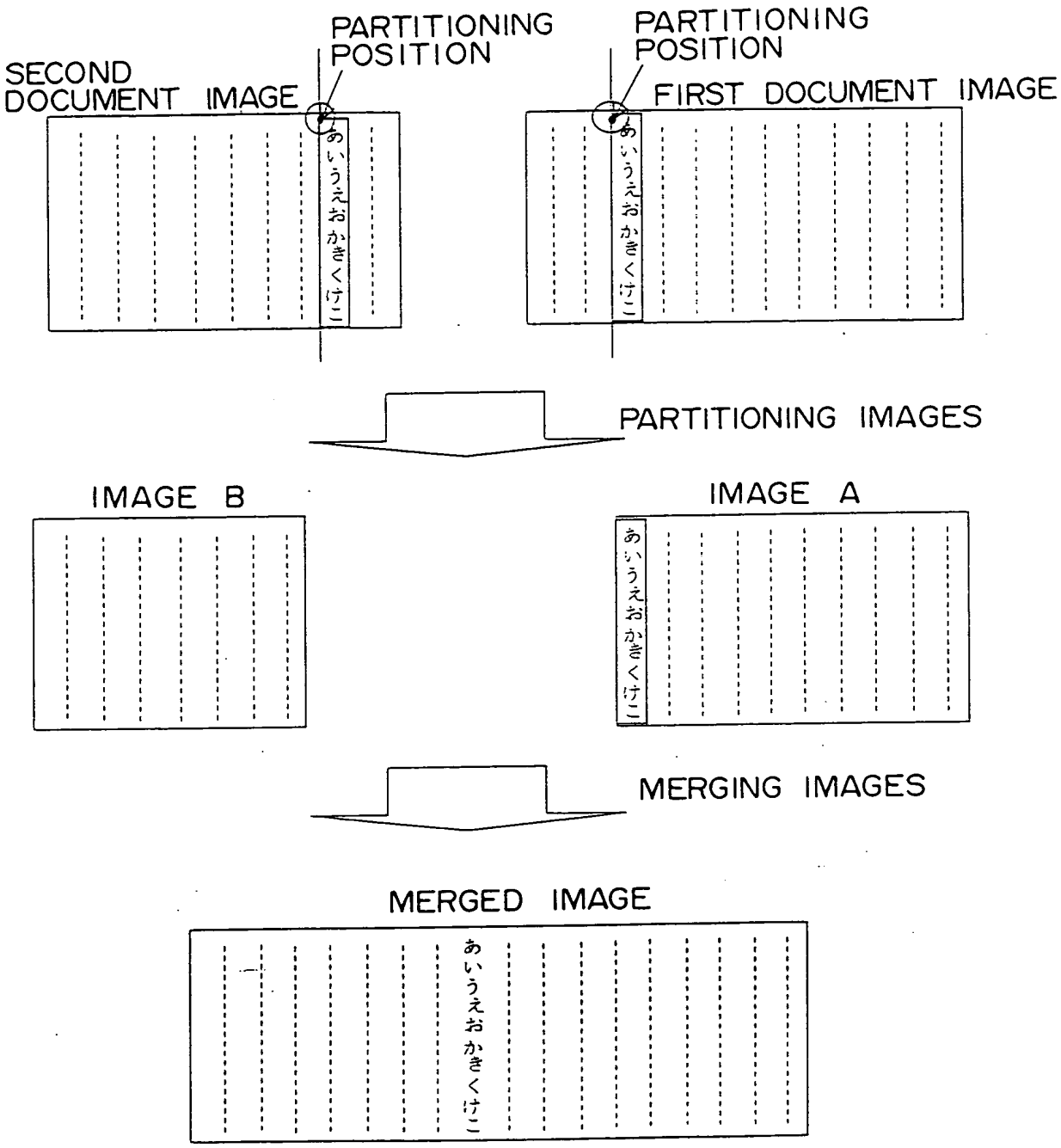

PARTITIONING POSITION
SECOND DOCUMENT IMAGE
PARTITIONING POSITION
FIRST DOCUMENT IMAGE
あいうえおかきくけこ
あいうえおかきくけこ
PARTITIONING IMAGES
IMAGE B
IMAGE A
あいうえおかきくけこ
MERGING IMAGES
MERGED IMAGE
あいうえおかきくけこ

FIG. 28

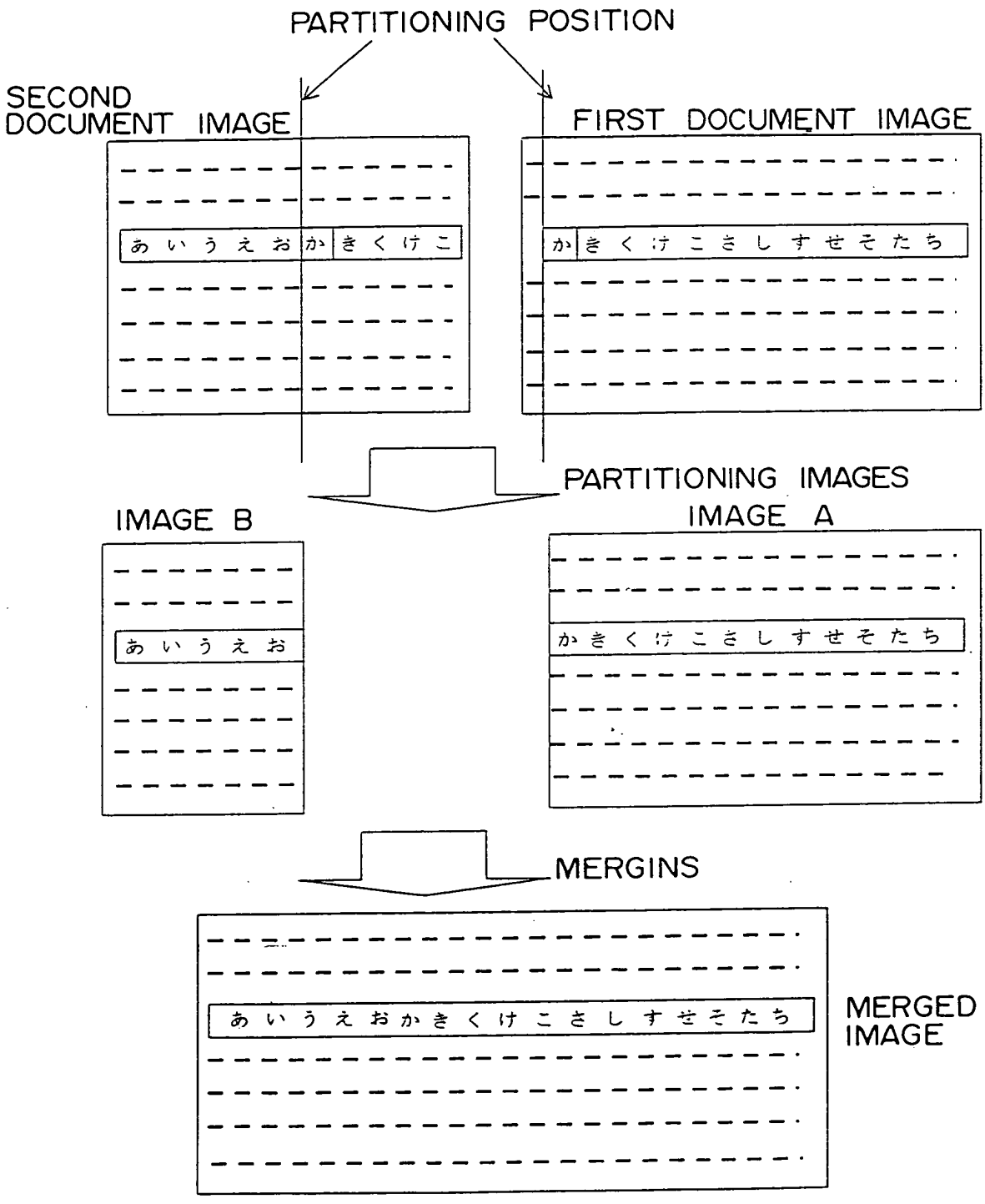

PARTITIONING POSITION
SECOND DOCUMENT IMAGE
FIRST DOCUMENT IMAGE
あいうえおかきくけこ
かきくけこさしすせそたち
PARTITIONING IMAGES
IMAGE B
IMAGE A
あいうえお
かきくけこさしすせそたち
MERGINS
あいうえおかきくけこさしすせそたち
MERGED IMAGE

FIG. 29

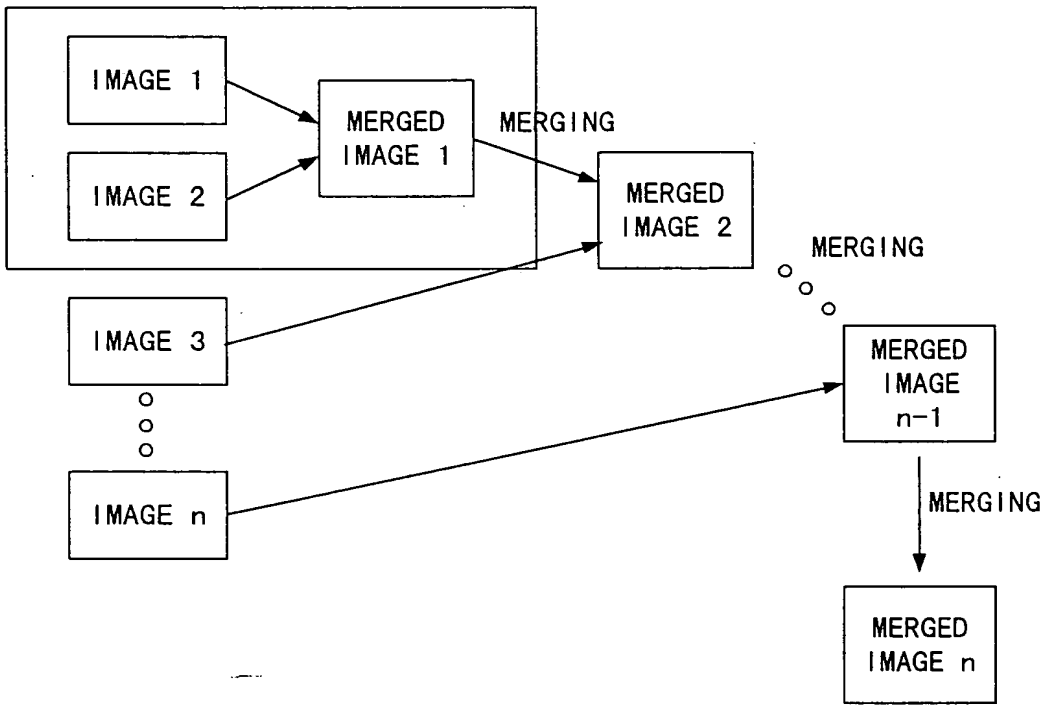


IMAGE 1
IMAGE 2
MERGED IMAGE 1
MERGING
MERGED IMAGE 2
MERGING
IMAGE 3
IMAGE n
MERGED IMAGE n-1
MERGING
MERGED IMAGE n

FIG. 30

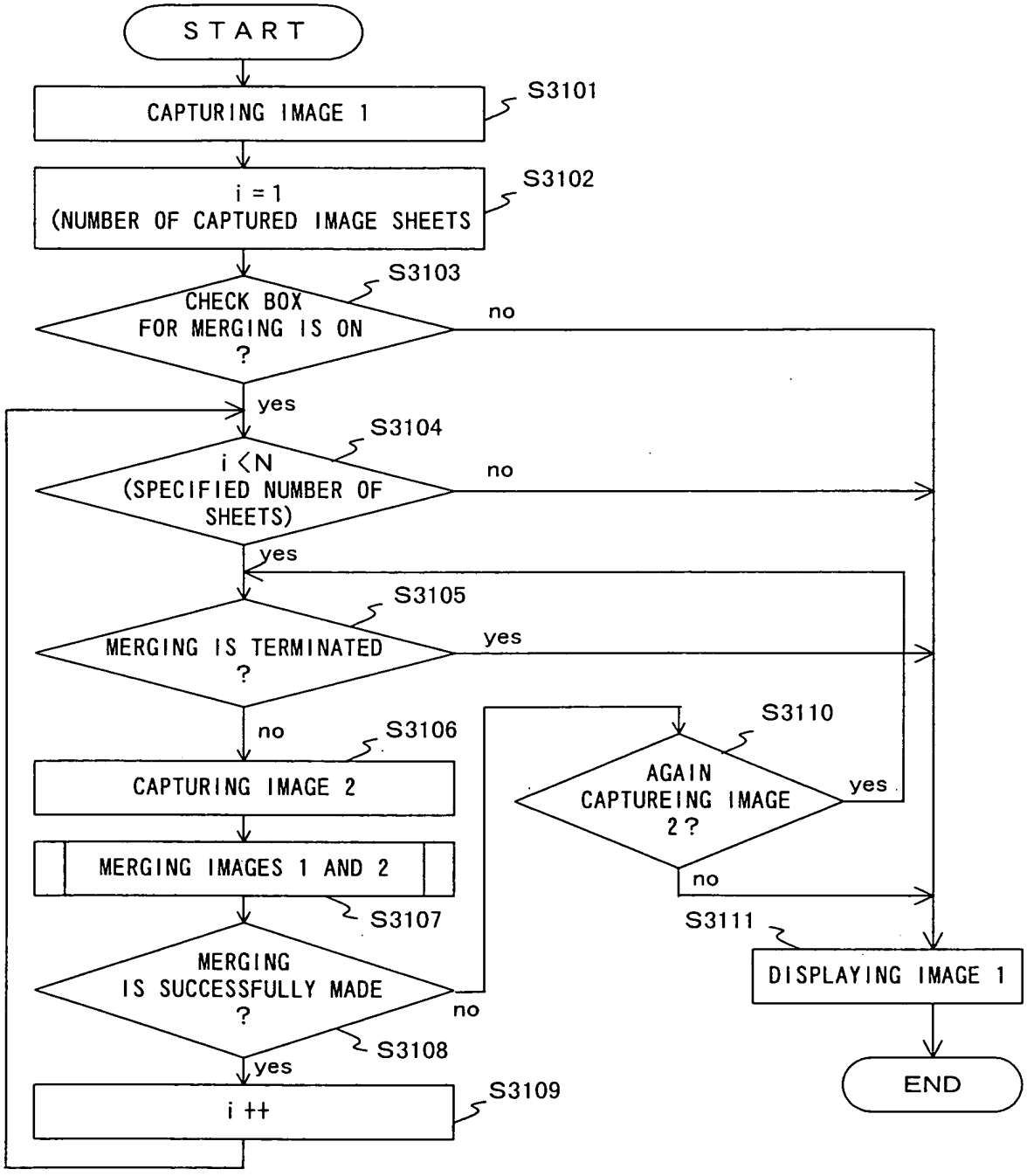

START
CAPTURING IMAGE 1
S3101
i = 1
(NUMBER OF CAPTURED IMAGE SHEETS
S3102
CHECK BOX FOR MERGING IS ON ?
S3103
no
yes
i <N (SPECIFIED NUMBER OF SHEETS)
S3104
no
yes
MERGING IS TERMINATED ?
S3105
yes
no
CAPTURING IMAGE 2
S3106
MERGING IMAGES 1 AND 2
S3107
MERGING IS SUCCESSFULLY MADE ?
S3108
no
yes
i ++
S3109
AGAIN CAPTUREING IMAGE 2 ?
S3110
yes
no
S3111
DISPLAYING IMAGE 1
END

FIG. 31

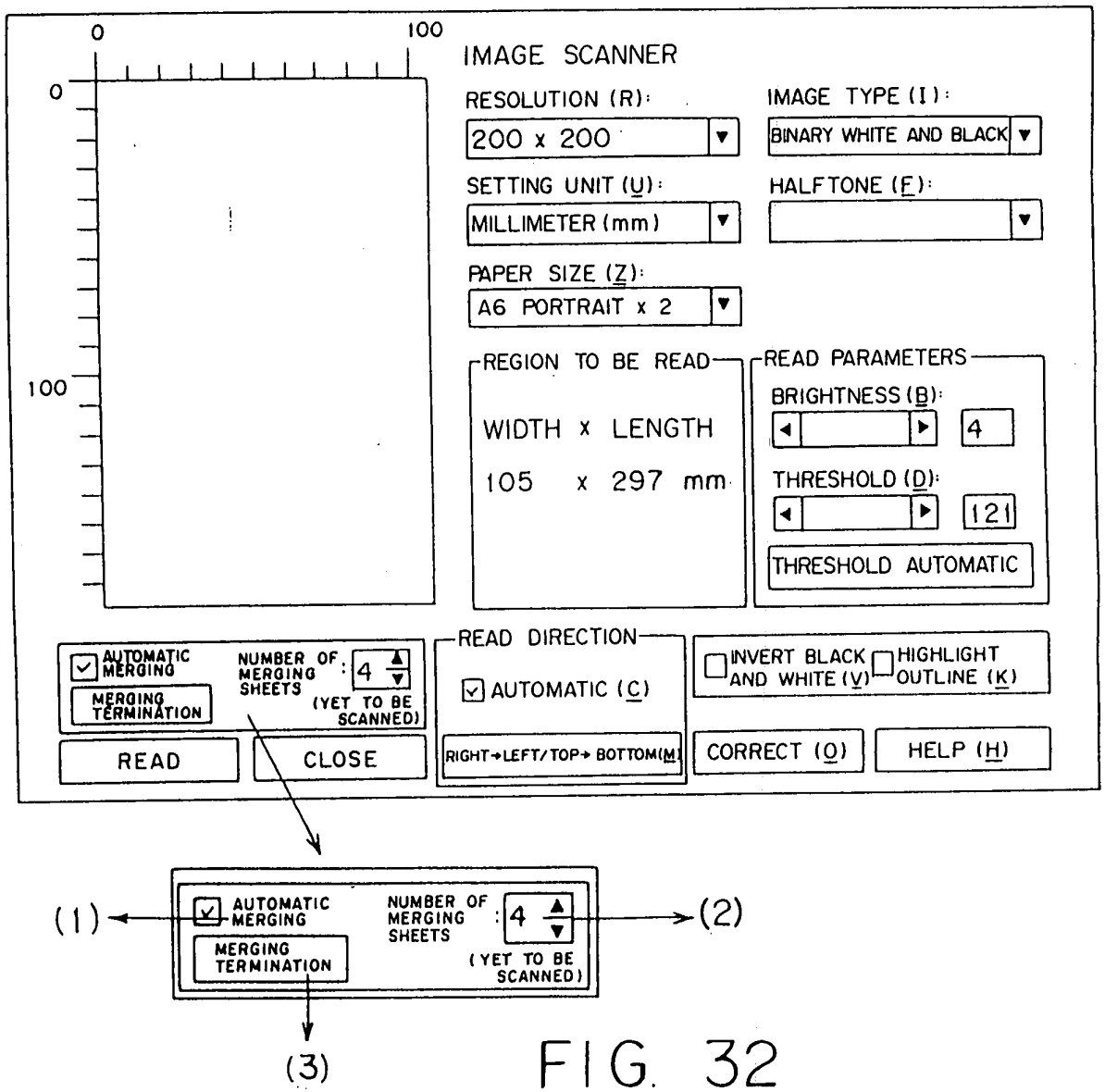

0
100
0
100
IMAGE SCANNER
RESOLUTION (R):
200 x 200
IMAGE TYPE (I):
BINARY WHITE AND BLACK
SETTING UNIT (U):
MILLIMETER (mm)
HALFTONE (F):
PAPER SIZE (Z):
A6 PORTRAIT x 2
REGION TO BE READ
WIDTH x LENGTH
105 x 297 mm
READ PARAMETERS
BRIGHTNESS (B):
4
THRESHOLD (D):
121
THRESHOLD AUTOMATIC
AUTOMATIC MERGING
NUMBER OF MERGING SHEETS
4
(YET TO BE SCANNED)
MERGING TERMINATION
READ DIRECTION
AUTOMATIC (C)
INVERT BLACK AND WHITE (V)
HIGHLIGHT OUTLINE (K)
READ
CLOSE
RIGHT→LEFT/TOP→BOTTOM(M)
CORRECT (O)
HELP (H)
(1)
(2)
(3)

FIG. 32

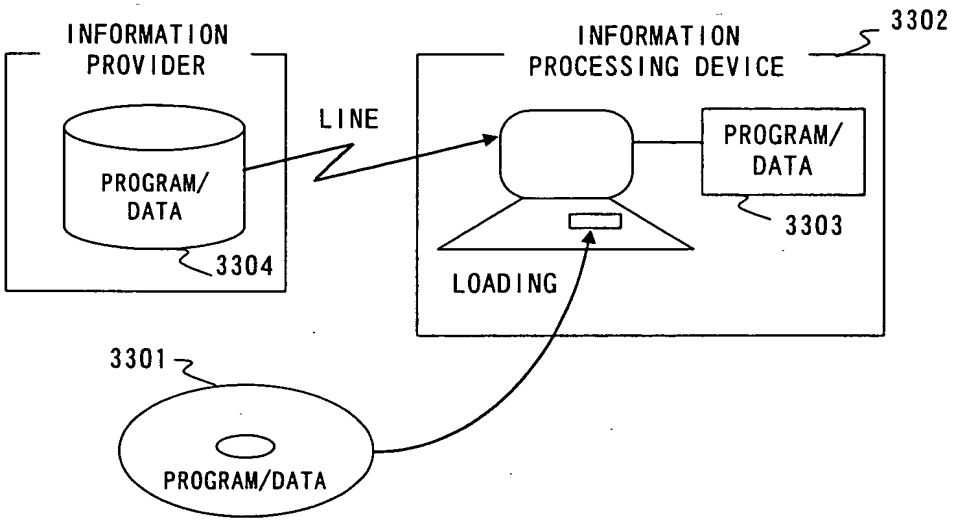

INFORMATION PROVIDER
PROGRAM/ DATA
3304
LINE
INFORMATION PROCESSING DEVICE
3302
PROGRAM/ DATA
3303
LOADING
3301
PROGRAM/DATA

FIG. 33

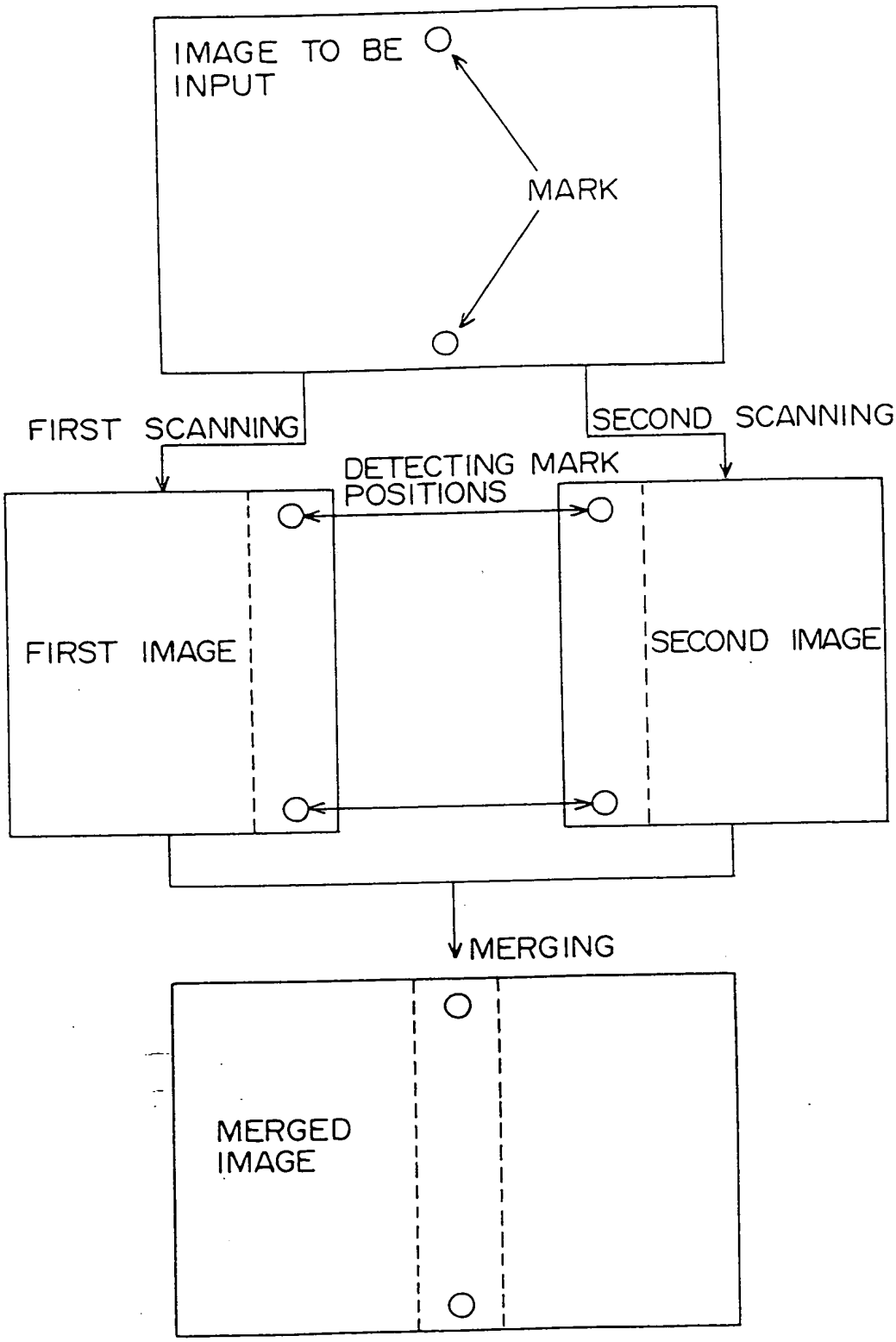


IMAGE TO BE INPUT
MARK
FIRST SCANNING
SECOND SCANNING
DETECTING MARK POSITIONS
FIRST IMAGE
SECOND IMAGE
MERGING
MERGED IMAGE

FIG. 34